VOL. XXXVII. THE COSMOPOLITAN. NO. 5.

I. PREFACE.—WHY AND HOW.

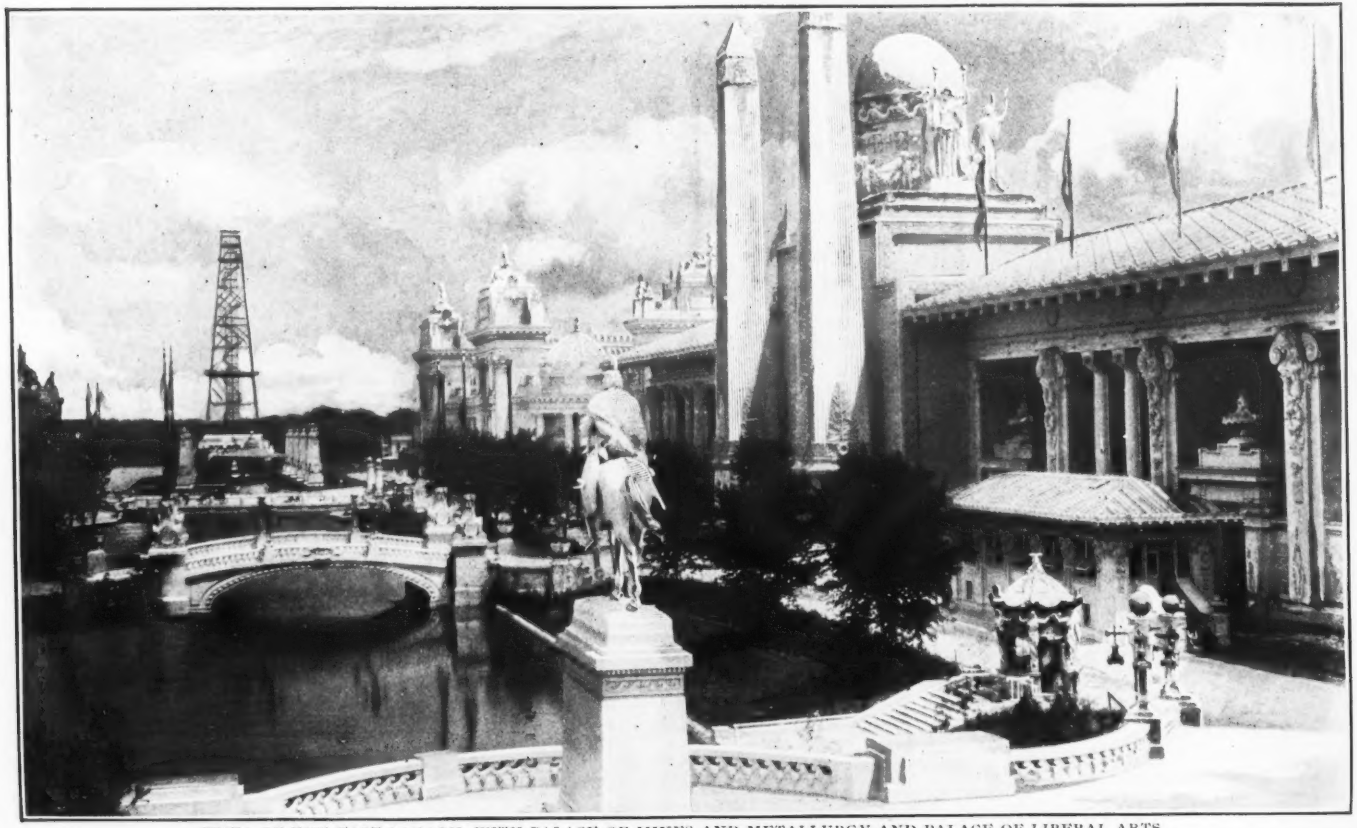
THE great fairs which the energies of Europe and America have held may be regarded as the tentative efforts which civilization is making in the art of organization, grouping and harmony. Each national exposition has measured the progress of mankind in the sciences and arts. Each has been an immense advance over its predecessors. It seems proper that a magazine which aims to be world-wide in its interest should devote an entire number to such a gathering together of the ideas and products of all peoples.

In the number of THE COSMOPOLITAN issued on the Chicago World's Fair, and again in that on the Pan-American Exposition at Buffalo, the preparation of articles was committed to a number of noted writers, with the result that while the volumes were most interesting, they did not give any idea of these Fairs as a whole. It seemed worth while to try to get the entire Exposition from a single viewpoint, and preserve its chief features in magazine form for the benefit of those who were yet to visit the Fair, as well as for those who would not have that opportunity, and also for those who should desire to keep in permanent form recollections of this wonderful Exposition.

To attempt this bird's-eye view of the Louisiana Purchase Exposition, the editor of THE COSMOPOLITAN went to St. Louis at the close of June, accompanied by two stenographic secretaries and a staff photographer. Securing the assistance of the chiefs of the several divisions under which the exhibits are classified, and through them of the heads of the various departments visited, it was possible to cover, during the eleven days occupied in the work, practically every department of the Exposition. Through the Chiefs of Divisions and the Heads of Departments, the salient features of each exhibit were reached without unnecessary delay. Cases that contained things of unusual interest were unlocked and the articles brought out for examination. Not only this, but important information regarding the condition of manufactures was obtained from heads of departments concerning exhibits which had failed to arrive, as in the case of the 1,750 horse-power gasoline engine, which presages a revolution in the use of power, and which is discussed more fully in the article on machinery. Each day up to sunset was devoted to an examination of exhibits—after that time, to the various shows of the Pike.

The effort has been to bring within the compass of one hundred and twenty-eight pages all of the salient features of the great Fair. The articles here given were dictated in the midst of the exhibits. The trips through the buildings were made with a stenographer to take impressions fresh as they came at the moment, and with a staff photographer to consider the illustration possibilities of the subject under consideration. A thousand pages might easily be written on these wonderful exhibits. As far as was possible within the limits of these pages, the most important features have been considered. And the result is offered not as a complete, but as an earnest effort to furnish the readers of THE COSMOPOLITAN with a series of articles covering in comment and fact the most important and interesting points of the Louisiana Purchase Exposition of 1904.

JOHN BRISBEN WALKER.



VISTA OF THE EAST LAGOON, WITH PALACE OF MINES AND METALLURGY AND PALACE OF LIBERAL ARTS.

THE COSMOPOLITAN.

From every man according to his ability; to every one according to his needs.

VOL. XXXVII. SEPTEMBER, 1904. No. 5.

OPENING CEREMONIES AT THE BASE OF THE LOUISIANA PURCHASE MONUMENT, APRIL 30, 1904.

II. WHAT THE LOUISIANA PURCHASE EXPOSITION IS.

BY JOHN BRISBEN WALKER.

EXPOSITIONS accentuate the deficiencies of the past, give us a realization of our present advantages, predict the developments of the near future, and equip the arm and brain alike of the mechanic, the engineer and the philosopher for further and immediate advances into the realms of the possible.

The World's Fair at St. Louis furnishes a magnificent example of what mankind may do when it shall substitute united exertion for contention in one great anthem of harmonious effort. With each world's exposition there are more and more minds impressed with the truth that if, by combining ideas, so wonderful a creation may be brought into existence, why should not a little widening of thought result in the building of great cities upon similar lines of harmony in architecture, in color, and in useful purpose?

Three things strike the thoughtful visitor to the World's Fair at St. Louis.

First, the great cost of the Exposition. It is estimated that nearly forty million dollars has been expended for a single summer's entertainment.

Second, the frightful waste involved in destroying these beautiful buildings and works of art when, with a little higher purpose, a little more careful planning and a comparatively small additional expenditure, these splendid specimens of architecture, these colonnades and plaisances, these beautiful canals and fountains, these delightful vistas, would have been left to be enjoyed for all time to come.

Third, the power of the people's half dollar, which, contributed during but three or four summer months, is able by the strength of its numbers to build palaces far outshining the most fantastic productions of an Aladdin's lamp, and fill them with every valuable thing, gathered together from every part of the entire world.

The World's Fair should be looked upon

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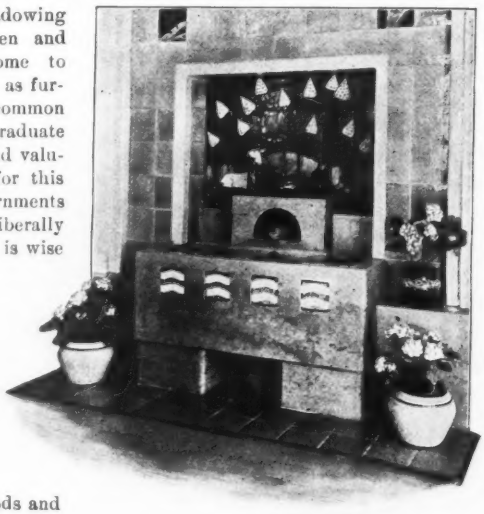
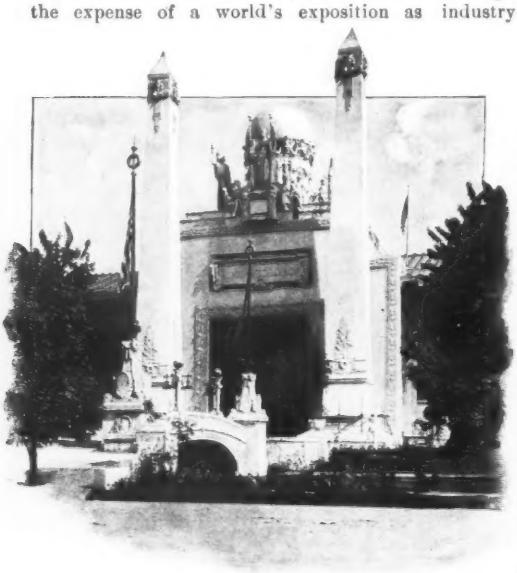
VISTA OF THE EAST LAGOON, WITH PALACE OF MINES AND METALLURGY

not only in the light of a foreshadowing of the wonderful cities which men and women will build when they come to understand organization fully, but as furnishing to the students of the common schools of the United States a postgraduate course in all that is interesting and valuable concerning life. And it is for this reason that Congress and state governments and city governments contribute liberally to an exposition. No philosopher is wise enough to estimate how great are the benefits derived from them. A single man might obtain one idea that will be worth to the world more than the entire forty millions of cost.



GERMAN ARCHITECTURAL EXHIBIT: RECEPTION-HALL DESIGN BY PROF. MAX LÄNGER, OF KARLSRUHE.

The certain result of an exposition is that every trade will, from the hour that the exposition opens, show marked improvement because of the new methods and new art brought from other parts of the world, and shown for the benefit of the workmen in all arts. So true is this that men who have studied the effects of expositions most carefully, hold that the National Government should itself bear all the expense of a world's exposition as often as every eight years; and that no expenditure in national finance can bring more general or lasting benefits, for every industry takes a jump forward, and the results are to be measured in hundreds of millions.



MAIN ENTRANCE TO PALACE OF MINES AND METALLURGY FROM THE SUNKEN GARDENS.

The organization of a fair begins years before its doors open. Usually this national advantage has its start in the local pride of some great city. Enterprising men get together and work out the lines upon which an organization may be perfected. St. Louis was fortunate in the number of such citizens. Governor Francis, President Thompson of the National Bank of Commerce, President Lee of the Laclede Bank, Mr. Charles W. Knapp, the editor of the St. Louis "Republic," are among those whom I personally know; and no city could have abler types of men for such a work. The original scope and plan of the Exposition was, I believe, prepared by Mr. Charles W. Knapp. The services were then secured of Mr. Frederick J. V. Skiff, Curator of the Field

OPENING DAY: GROUP ON THE STEPS OF FESTIVAL HALL.

Museum, who had been chief of an important department at the Chicago World's Fair, and whose experience covered both the Pan-American Exposition and that of Paris in 1900. To him was committed the working out in detail of the plans of the Exposition. Men who had become expert in other world's fairs were then secured and despatched to Europe, Asia, Africa and Australia. To give an idea of the immense work done, it may be mentioned that Lieutenant Carden, U. S. R. C. S., spent two years in Europe studying machinery. During this time he visited more than twelve hundred factories, and brought back information of the greatest importance to American manufacturers.

St. Louis, having determined upon an exposition, resolved that it should excel all previous efforts in this direction. To begin with, a site of twelve hundred and forty acres was acquired—nearly twice that on which the Chicago Exposition stood. Lacking the beautiful lake-frontage of Chicago, it possessed, nevertheless, the great advantage of a contour of hills rising sixty-five feet above the plain. Upon this have been erected no fewer than fifteen hundred and seventy-six distinct buildings. One of these, the Transportation Building, covers sixteen acres. That is equal in area to the ground space of four hundred and forty New York houses of twenty by eighty feet. But if that does not paralyze the mind in its vastness, there is another building, that of Agriculture, which covers more than twenty acres.

When one sees at the Exposition such a magnificent contribution as that made by Germany, in all departments of work, one wonders whether such generosity is not misplaced, and whether the country in giving its best ideas away, so to speak, does not

VIEW OF THE GRAND BASIN AND LOUISIANA PURCHASE MONUMENT FROM THE FOOT OF THE CASCADES, SHOWING THE PALACE OF EDUCATION AND SOCIAL ECONOMY AND THE PALACE OF MANUFACTURES.

PALACES OF ELECTRICITY AND MACHINERY FROM THE CASCADE GARDENS.

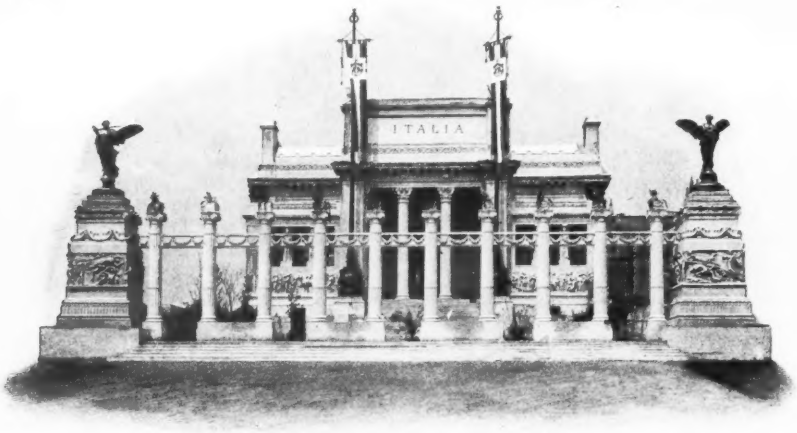
lose. I was still puzzling over this thought when I arrived in the Transportation Department, and found there a splendid array of cars and locomotives put in by the New York Central, the Pennsylvania and other great railways for the instruction and pleasure of the visiting public.

Then the matter was quickly decided for me—in this way. On one track is exhibited a French locomotive guaranteed to give a speed so surprising that it leaves our Empire State Express trains in the rear. Four cylinders compounded, working four distinct driving-rods, furnish an entirely new form of engine so far as American practice goes. Already it is announced that this splendid engine is to go into service on the Pennsylvania at the conclusion of the Exposition. But the New York Central has almost an exact copy of the same engine which is shortly to be put into its fast service. Its arrangement of interior cylinders, however, seems to be an improvement over those of its French prototype. There is greater facility for reaching the interior parts, and I should say that positive advance has been made in construction. I had found the reply to my query; it was simple. Yes, each who exhibits gives much to the public; but each probably gets back many times what he furnishes others. And at this point the conclusion of the investigator is reached: *that so important are these great expositions to the progress of a country and its people, that if necessary the entire expense should be paid by a national government, and they should recur at intervals not exceeding a decade.*

It is impossible to estimate the benefit to be derived by a country from an exposition such as that at St. Louis. The indirect advantages are probably many times as great as those which appear on the surface. One of these is found in the complete studies which our representatives have made of the industries of different European countries.

As already referred to, Lieutenant Carden, of the United States Revenue Cutter Service, being sent out to investigate, made an inspection covering more than twelve hundred industries. Through various causes many of the results of this inspection do not show at the Exposition, but directly or indirectly, sooner or later, all of this work will have its reflex upon the industries of the United States.

There are to be found at the Exposition other stories than those of merely material progress. For my part, no single exhibit was so impressive as the first cabin home of Abraham Lincoln—the log house built in the most economical way even for log houses, the low roof with the daylight shining through the shingles—with his mother's spinning-wheel of cheapest home construction, and some other household goods of the same order. It should be an object-lesson to American youth to enter this humblest of cabins and think of the boy Lincoln sprawled in front of a wood-fire, trying to decipher the printed pages



THE ITALIAN PAVILION.

of his only book. Luxury is inimical to greatness. It is hard discipline that makes great characters.

The most surprising figures are given as the cost of exhibits. Take the one article of amber. I was astonished to find that it was shown at all at the Fair, yet in one room of the German exhibit alone this article was on show to the amount in value of one hundred thousand dollars.

When the nations of the globe come to line up alongside of one another at a World's Fair, some of the results are surprising. It is the place where, of all others, national brag is punctured.

It is a place where there must be recognition of the progress being made by nations who teach science and build factories. And the supreme lesson taught is that a nation must be sufficient within itself, must be ambitious to supply itself, and to legislate for its own people. One has but to study the great exhibits made by Japan, second only to those of Germany, to learn that the remote peoples of to-day will be the manufacturing nations of to-morrow; that the time we take up discussing furnishing these peoples with their supplies will be lost, and that if we are to be ourselves prosperous, we must be content, first, with perfecting our methods of production, and, secondly, with distributing that which we produce for the enjoyment of our own people.

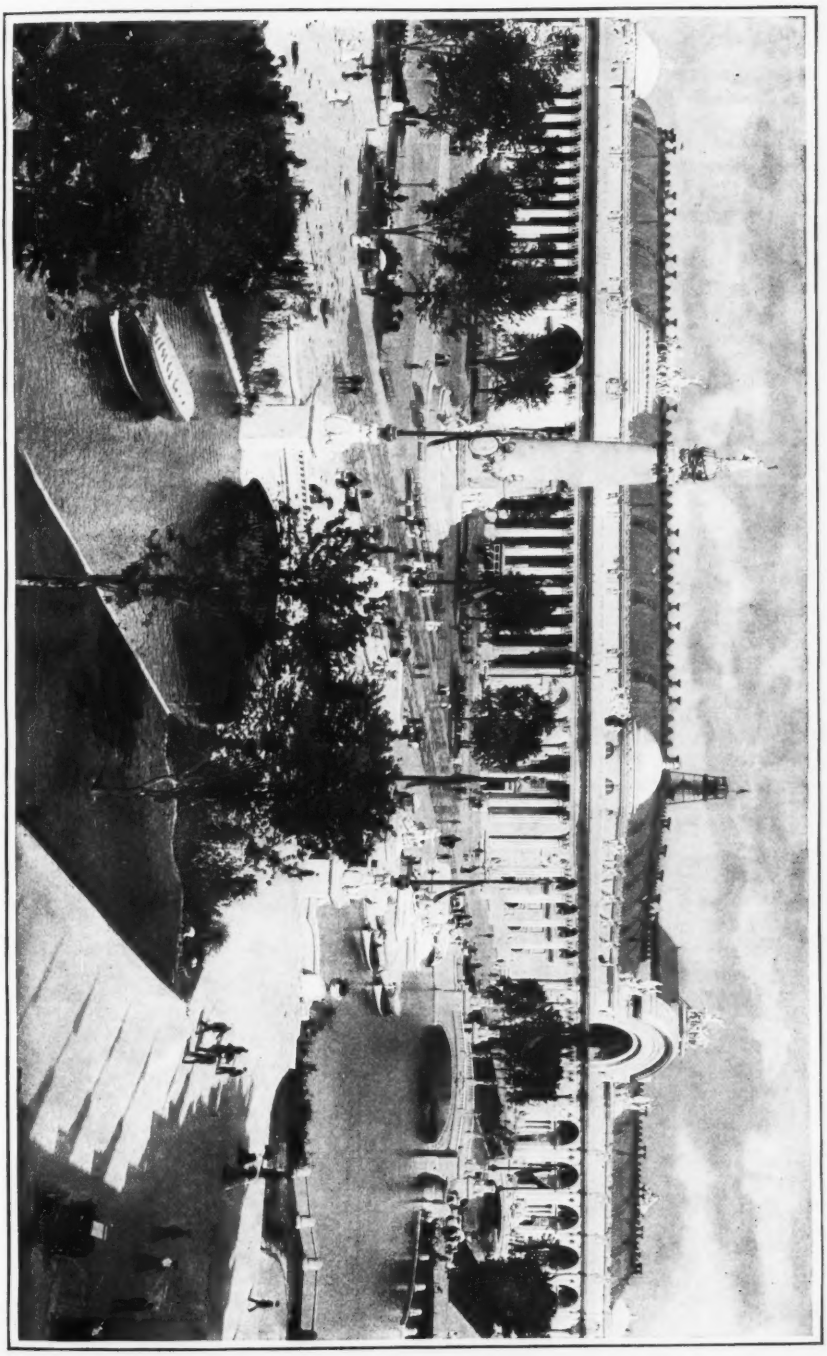
Sunday morning at the Exposition is not for the public, but sitting at the end of the mirror-like lagoon, in which are reflected green trees, the obelisks of the Mines and Metallurgy Building, the long row of cream-white columns, and the prancing chariot-horses of the Education Building, one necessarily takes on a devotional frame of mind. A thousand birds are twittering from their nests under the great porticos. There is an air of peace and calm, restful beyond measure after the seething mass of tired, shouting, angry men and women in the Democratic convention from which I had gone out long after midnight of the preceding day.

The Exposition was all my own. Not a human being was on the Plaza; only a guard at one of the doors stood sentry, almost as motionless as one of the staff statues round about—his khaki uniform no different in color.

Off to the left at the end of a sunken garden rises the United States Building, it too topped with chariot and horses. Why should education have the same symbols as an exhibition of what chiefly pertains to war?

This brings to mind the beautiful variety and perfect harmony of outline and color of the Buffalo Exposition. In comparison with that, St. Louis architecturally and artistically is crude. Everywhere there is evident the seeking for bigness at the expense of harmony.

Either there was jealousy in the board



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FOOT OF THE GRAND BASIN, SHOWING PALACE OF MANUFACTURES, THE MONUMENT AND THE TRANSVERSE LAGOON.

CHINESE PRINCE AND HIS SUITE, IN FULL DRESS, ON THE EXPOSITION GROUNDS.

which designed the St. Louis buildings, or there was stupidity, or there were limitations, of which the public knows nothing, placed upon the architects. The palm for novelty of design and for beauty in outline must, I think, be given to the Mines and Metallurgy Building. The groups of statuary through the grounds are often poor, and convey the idea of having been manufactured on such orders as this: "Ship us a dozen of your medium-grade statuary groups." Everywhere is incongruity carved with the tool of mediocrity—neither elevating in thought, nor high in conception, nor new in idea. What seem to be cupids are grouped around the globe dome of the Mining Building, while figures intended to resemble those which stood in so forceful an attitude at the end of the great Water Court at Chicago, appear in commonplace and incomprehensible attitudes. But there are others which are truly great, and notably among them French's "Napoleon." One cannot understand why this great statue has been placed in so obscure a spot. It is destined to take rank as one of the three greatest statues of Napoleon.

Presently, as I stand watching the beautiful colors and shapes reflected in the water, the soft gray clouds obscuring the sun, the perfect quiet is broken by the tap of a gondolier's oar. The Venetian boat comes out from under an arched bridge; the gondolier lazily puts his oar into the water with graceful sweep, and as lazily withdraws it. He is the picture of a perfectly contented life—doing labor, not strenuously and discontentedly as an American so often works, but 'gently and happily and artistically, getting quite enough out of existence, and content to let others also have their share. How gladly, it seems to me, would I change places with him and drop this life of rush into which we Americans seem driven—our labors increasing according to the square of our efficiency—or supposed efficiency—and take up this placid, uneventful existence, which lets a Democratic convention drift by without a thought as to its composition, and is content to let visitors come and see for themselves, instead of being told about the Exposition.

III. THE FIVE GREAT FEATURES OF THE FAIR.

By John Brisben Walker.

THE realization which the Exposition brings to us of the progress which has been made in every line of thought and production in the short eleven years which have followed Chicago, is undoubtedly its most striking feature.

In the mechanical world, things that were unthought of in 1893 are to-day in fully developed fields of usefulness. We are able to appreciate that civilization is advancing by bounds so tremendous that the average human being can scarcely measure them.

We are able to appreciate that whereas the world of forty years ago contained a few men having a knowledge of organization and some knowledge of science, some knowledge of government and some crude ideas regarding education, to-day these trained brains have been multiplied by a hundred thousand. Our schools are turning out men and women capable of thinking, and industrial development has offered opportunity for these to exploit their theories, until the difference between the men and women of 1920 and those of

CHINESE PAVILION, A COPY OF PRINCE PU LUN'S PALACE AT PEKING.

STATUE OF JOSEPH HENRY, FORMER SECRETARY OF THE SMITHSONIAN INSTITUTION, BY JOHN FLANAGAN. EAST ENTRANCE PALACE OF ELECTRICITY.

1893 promises to be greater than that between the Pilgrims at Plymouth Rock and the aborigines of Massachusetts. Everywhere the facts are impressed upon the mind that education is advancing man's usefulness a hundredfold, and that to-day ten thousand intellects are searching the secrets of nature with improved apparatus where formerly a single hesitating mind gave desultory thought in these directions.

Perhaps the greatest single feature of the Fair is that the very intelligent body of men composing its directorate and management should have been bold enough and broad enough to devote a single item of one hundred and fifty thousand dollars to exploiting aerial flight, the very idea of which was considered so chimerical at the time of the Chicago Fair that only one scientist in the country dared approve of an investigation of the subject. When every other feature of the St. Louis Fair has been forgotten, this one fact will go down into history and be recalled to the eternal credit of the men who favored the idea of so liberal an expenditure. It is a great misfortune that, after the management had proved itself so broad-minded, the execution of its plans could not have been placed in the hands of some one competent to carry them out properly. Mistakes have characterized this branch of the work at every turn. I don't even know the name of the man to whom this department was committed, but certainly he could have had but a very dim idea of his subject. If, instead of making crude rules, and expending money on enclosures and gas-plants, he had been a man who comprehended what he was about, the world would have secured different results.

The third striking fact in connection

IGORROTES AT WORK IN THE GROUNDS OF THE PHILIPPINE EXHIBIT.

GENERAL VIEW OF THE GRAND BASIN AND THE PLAZA OF ST. LOUIS, ONE OF THE BEAUTIFUL VISTAS OF THE EXPOSITION.

with the Exposition is found in its proportions. Forty millions have been expended on buildings so large that the booths in one structure alone have a frontage on the various aisles of nine miles. It is not likely that in many years to come the extent of the St. Louis Exposition will be exceeded. In mere size it has so eclipsed all previous records as to leave no desire upon the part of the managers of future expositions to excel in this respect. If one could make a criticism, it would be to say that it is too large, and in the future we shall behold efforts to surpass not in size, but in the perfection of detail.

A LESSON IN ARCHITECTURE—BUILDING THE ROOF OF A HOUSE IN THE PHILIPPINE VILLAGE.

The fourth striking feature of this World's Fair lies in the fact that it is primarily an exposition of processes. In other fairs, we have had *things* on show. In this, we have the practical operations exhibited for our information. In the Mining Gulch, real metals are being smelted, real wells being driven. In education, real children, drawn from the public schools of St. Louis, are being taught in classes for the benefit of visiting teachers. Rock-drills are putting real holes through masses of granite. In the Manufactures Building, real leather hides are being treated to render them soft and pliable, then are cut into shoes. We see the upper nailed to the last, then sewed and trimmed, until finally we behold the perfect shoe. And if you would seek the greatest crowds, you must go to these practical operations to find them. People gather there in deep rows. They seem to be fascinated by each operation, and stand watching intently from first to last.

The fifth salient fact is the showing which the Exposition makes that science is being introduced into every branch of the life of man and woman. In education it stands first. It forms the basis of all true education, and that the world is recognizing this is proved in almost every educational exhibit. It has been carried into every branch of manufactures. The nations excelling in manufactures are those which are being best educated in science. It is being carried into the commonest forms of business life. This is illustrated in the very simple operation of cutting off a piece of cheese, which in the olden days was a matter of guesswork. The grocer took his knife, made a lunge, and begged your pardon that he had cut off a pound and a quarter instead of the half pound of cheese that you asked for. In 1904, he goes about this business in a scientific way. Let us suppose that the cheese weighs fifteen pounds. A vernier with a clamp screw is fixed at the figure 15 and clamped. Then, an ingenious dial is moved around a ratchet bearing the figures from zero ounces up to twelve ounces and so on to sixteen. The small dial has previously been set for the price per pound. Let us say that that price is twenty-three cents per pound. All the grocer does now is to move the ratchet to the revolving figures which are on the dial, and which show the amount ordered. For instance, the figure 10 would call for ten cents' worth of cheese. There is no mental operation on the part of the grocer; it is simply a matter of moving the lever to the right figure, after the dials have been set. If you wish eight cents' worth of cheese, worth twenty-three cents a pound, you get it exactly—no more, no less.

Science is brought in to determine the quality of the milk one buys in the city, or to pasteurize it if germs are feared. Science is rapidly covering the field of human ailments, and discovering the preventive or cure. Science is even invading the realm of the mind and undertaking to point out the germs of good and evil; and science is taking the drunkard from the gutter and releasing him from the slavery of the alcoholic germ. Everywhere in everything throughout this great Exposition we find science taking its place permanently.

END VIEW OF BELGIAN PAVILION IN THE STYLE OF THE FLEMISH RENAISSANCE WITH EXTERIOR MURAL DECORATIONS.

IV. THE EDUCATION OF THE WORLD AS SHOWN IN THE EXHIBITS OF MANY PEOPLES.

THE IMMENSE IMPORTANCE OF THIS PART OF THE EXPOSITION—HOW EVERY PROBLEM OF GOVERNMENT, ART, MECHANISM AND MATERIAL PROSPERITY IS SHOWN AS CENTERED AROUND THAT OF THE WORLD'S EDUCATION.

By John Brisben Walker.

THE exhibit of the Department of Education accentuates what government organization means when applied to any one phase of life. In Chicago, in 1893, not only was there no Education Building, but such exhibits as were shown were very largely confined to photographs of school-buildings and samples of children's work: in other words, were as meager as it is possible to conceive. Shortly after this, the Bureau of Education, in Washington, received fresh impetus, and meetings of the National Educational Association began to be held. The result of bringing together a part of the best brains of the country in educational work and of having a definite organization in Washington quickly began to make itself felt, and in St. Louis we are able to comprehend the advances which are being made in education in all parts of the country.

It is possible in the great building devoted to education at St. Louis to form a pretty fair idea of the intelligence of the country by examining the various exhibits. We find those Southern states which have least understood that education must be the foundation of all advance, both material and otherwise, have no exhibits at all. In others, the exhibit is very meager, the legislatures having appropriated so little that in some cases it was necessary for private individuals, actuated by state pride, to furnish the necessary material. It is when you come to the great states of Massachusetts and New York that you can recognize both how much is being done for education and what effect that education is having on the people.

I was fortunate enough to be accompanied by Dr. Howard J. Rogers, under whose care this great exhibit has been

PAVILION, AND SPECIMEN OF LANDSCAPE-GARDENING, IN THE GROUNDS OF THE JAPANESE EXHIBIT.

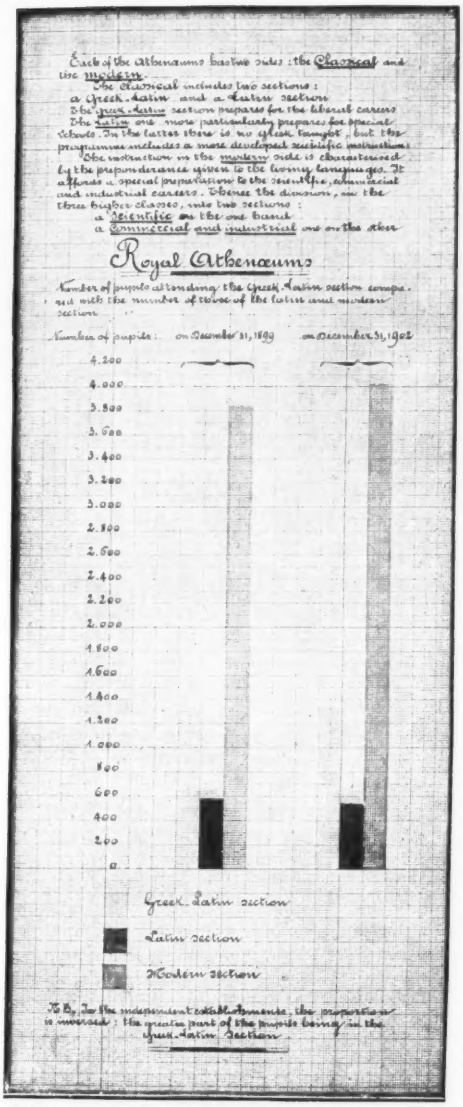
worked out. By chance we sat down in front of a tabulated statement in the New York exhibit. It showed that in 1850 the appropriation for common schools in New York state was $1,607,684. In 1904 it is over $41,000,000. This would seem to be a satisfactory ratio, but when you reach the last line of the table the mind is appalled before the insignificant total for the whole United States, which is only $235,000,000, against an army expenditure of more than $400,000,000 at the present time.

Another table is almost equally interesting. It is the per capita expenditure for common schools. In Alabama they spend fifty-eight cents for each person. In Arkansas they spend $1.18. In Colorado, to which state the Australian Commissioners who went through the schools of the United States some years ago awarded the palm for having the finest schools in the world, the per capita expenditure is $7.60.

This is the maximum for any state. It is the maximum because Colorado is composed of an enterprising people of a high order of intelligence, who brought to the organization of the commonwealth the best thought of nearly every state of the Union, and the people recognize that, above all things, education is the most essential aid to its prosperity.

New York comes second with $5.70. Again the eye rests on some of the Southern states. Louisiana, horribly, only eighty-nine cents; Tennessee, ninety-one cents; North Carolina, sixty-eight cents; Georgia, ninety-eight cents, and Kentucky, only $1.33. If the visitors from these states wonder why their lands are not valuable, their industries developing slowly and immigration not seeking their beautiful valleys, they may find the answer in these statistics. Let them bring up their annual expenditure to that of Colorado, and every financial problem will be solved. Let them continue to expend from fifty-eight to eighty-nine cents per capita, and the negro problem will become so violent that there will not be wisdom enough in this country to solve it.

Another table in the New York exhibit shows the growth of schoolhouses. The World's Fair at Chicago was but eleven years ago, yet in the time since then there has been more growth in the value of schoolhouses in New York state than in the preceding hundred years. The aggregate value has come up from forty-nine


Each of the Athenaums has two sides: the Classical and the Modern.
The Classical includes two sections:
a Greek-Latin and a Latin section
The Greek-Latin section prepares for the liberal careers
The Latin one more particularly prepares for special schools. In the latter there is no Greek taught, but the programmes includes a more developed scientific instruction.
The instruction in the modern side is characterised by the preponderance given to the living languages. It affords a special preparation to the scientific, administrative and industrial careers. Whereas the divisions, in the three higher classes, into two sections:
a Scientific on the one hand
a Commercial and industrial one on the other
Royal Athenæums
Number of pupils attending the Greek-Latin section compared with the number of those of the Latin and modern section
Number of pupils: on December 31, 1899 on December 31, 1902
4.200
4.000
3.800
3.600
3.400
3.200
3.000
2.800
2.600
2.400
2.200
2.000
1.800
1.600
1.400
1.200
1.000
800
600
400
200
0
Greek-Latin section
Latin section
Modern section
N.B. In the measurement called Armants, the proportion is inversed: the greater part of the pupils belong to the Greek-Latin section.

BELGIAN EXHIBIT—CHART SHOWING THE RAPID CHANGE TAKING PLACE IN THE BELGIAN SCHOOLS, THE DECLINE OF GREEK AND LATIN STUDIES AND THE ADVANCES MADE IN THE STUDY OF THE SCIENCES.

million dollars to ninety-nine million dollars. During this time log schoolhouses have decreased from one hundred and thirty to four. I do not wish to be considered as averring, however, that the log schoolhouse was not a model schoolhouse in respect to ventilation, comfort, and in other ways.

A suggestion is offered by a magnificent map on the exterior of the New York exhibit. It is to the effect that the panels on the walls of the House of Representatives should be removed and maps similar to one which I found in the New York exhibit inserted for the benefit of ignorant congressmen. This map shows every schoolhouse in the state of New York. It gives in figures the normal student capacity. It also indicates the construction of the house, and wherever the children of one school district are transported to another the route is indicated. And in great figures at top and bottom of each state map should be printed the per capita state expenditure for education.

An instructive map for children, and for "grown-ups" as well, shown in the New York exhibit, is one of the United States, in which each of the states is drawn in its proper place, but instead of the names of Pennsylvania or Colorado being given, as the case may be, we have New Zealand, Cuba, et cetera. It teaches with one stroke of the eye the relative sizes of foreign states. A child or a man might study half a day to acquire the information given here at a glance.

Passing through one of the aisles of the Missouri exhibit in the Education Building, we found a crowd so large that it was impossible to get near the center of the place. Through the efforts of the Chief of the Department, however, we succeeded in making our way to a kindergarten exhibition which was in operation. The children are brought in each day from the public schools of St. Louis and given a full afternoon. Earlier during the Fair, there had been cooking-school lessons. Later on, there will be demonstrations of other kinds of practical school-work. The crowd at this exhibit illustrated well the intense interest which the average human being takes in the thing exhibited

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THE UNITED STATES GOVERNMENT BUILDING, WITH TERRACES OF STEPS LEADING TO THE SUNKEN GARDENS.

in operation versus in theory only. If the chief of the exhibit had realized fully this trait, he would, instead of trusting to the aisles, have had a large amphitheater constructed for the visitors who each day show a desire to see these exhibitions.

In the Iowa exhibit is found another chart of immense interest to the people of the United States. It ought to be the center of the exhibit. Unfortunately it has been put in a dark corner. It is a table showing illiteracy in the United States. Louisiana occupies the top of the list with nearly forty per cent. of illiterates. South Carolina comes next, Alabama next. Mississippi, Georgia, North Carolina, Virginia, Florida, Tennessee following. At the bottom of the column, showing a percentage of illiterates less than five, stand nearly all the new Western states, and Utah, Washington, Kansas, Iowa and Nebraska occupy the places of honor. Nebraska carries off the highest honors, and Iowa comes next.

I asked why this chart was put in a corner instead of in a prominent central place. They said that it might hurt the feelings of our Southern friends. No one has more Southern friends than the writer of this, but I earnestly desire to hurt my friends in this way. It is a table of facts which must be brought to the attention of

FREDERICK J. V. SKIFF, DIRECTOR OF THE DIVISION OF EXHIBITS, DELIVERING ADDRESS AT THE OPENING CEREMONIES, APRIL 30, 1904.

the splendid men and women who love their states.

Very few people in the United States know that the state universities of the West are to-day greater in the number of students, in the annual appropriations and the work they are doing, than all of our more famous privately endowed colleges of Harvard, Yale, et cetera, put together.

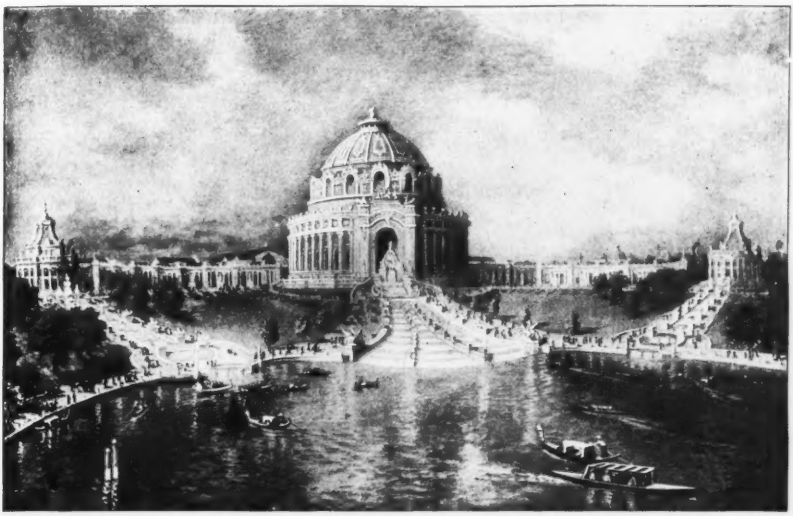
Notable has been the growth of the

SCENE IN THE SAMAL MORO VILLAGE—PHILIPPINE EXHIBIT.

agricultural and mechanical colleges, and the exhibits of these institutions at the Fair are especially interesting in their showing of practical operations.

Of late years a new idea has been developed in education. This is that it is just as important to teach the adult man and woman as it is the child. Indeed, we are now beginning to comprehend that the continued education of the adult, taken as a whole, is even more important to the state than the training of children. Nine hundred and ninety-nine persons out of a thousand are so poorly educated that in their life-work they are constantly hampered by their ignorance. THE COSMOPOLITAN MAGAZINE was the first to attach world-wide importance to this idea, and it demonstrated that it is entirely possible to carry on instruction at home by means of correspondence during odd hours of leisure while the student, man or woman, is engaged in the ordinary vocations of life. For nearly five years it conducted free correspondence instruction, and immediately upon the opening of that work more than twenty

PHILIPPINE EXHIBIT—PORTION OF A RELIEF MAP OF THE ISLANDS BUILT IN THE OPEN AIR. HORIZONTAL SCALE NEARLY ONE AND ONE-QUARTER INCHES TO THE MILE; VERTICAL SCALE EIGHT TIMES AS GREAT.



THE FESTIVAL HALL, THE TERRACE OF STATES, THE RESTAURANT PAVILIONS AND THE THREE GREAT CASCADES.

thousand students were registered, showing its popularity. After nearly five years of this work, at one time having a staff of upward of twenty persons, it was discontinued in favor of the institutions which were taking it up as a business matter.

To-day there are over two hundred schools conducting instruction by correspondence. These have the immense advantage that they secure students who earnestly desire knowledge, not those who merely desire degrees.

It is impossible to overestimate the good work which these correspondence schools are doing to-day. The students of one institution alone now number seven hundred thousand, in comparison with which the attendance at the greatest universities of the land dwindles into insignificance. Thirty-two hundred instructors and employees are engaged by this firm. A course in chemistry in this correspondence school embraces eight books. The course is based upon the hypothesis that a man is ignorant not only of the subject of chemistry, but of the mathematics that precede it. Consequently, the first book covers Arithmetic, Algebra and Physics; the second, Inorganic Chemistry; the third, Qualitative Analysis; the fourth, Organic Chemistry; the fifth, Quantitative Analysis, and the sixth, seventh and eighth volumes are devoted to Applied Chemistry.

As an example, sulphuric acid is treated from the manufacturer's standpoint, including the turning out of the raw materials and their treatment; and it gives the methods for final purification and concentration. Then come the alkalies and hydrochloric acid, et cetera.

These correspondence-school volumes are four by six inches in size, have cloth bindings with leather backs and corners, and contain each five hundred or six hundred pages, of good paper, well printed in large type. The entire course in chemistry costs but ninety dollars. The student has the right of instruction for five years. The eight volumes are sent out to him immediately, and he may pay in cash for them all, or in instalments of two or three or five dollars a month, if his means make the immediate payment difficult.

At the end of each book there is an examination. The questions are stated plainly, and the student is obliged to answer the same neatly on sheets of paper of uniform size. The answers are forwarded to the correspondence school, and there they are carefully examined, corrected and returned. He has the privilege of asking whatever

questions he chooses, and if he desires to do so he may write each day.

The courses of this institution number one hundred and fifty, and include instruction in foreign languages, phonographs being sent out into which the sentences have been spoken by men having the best accent. As a consequence, the student who acquires the language in this way does not learn French as it is spoken in Podunk, but French as it is heard in Paris.

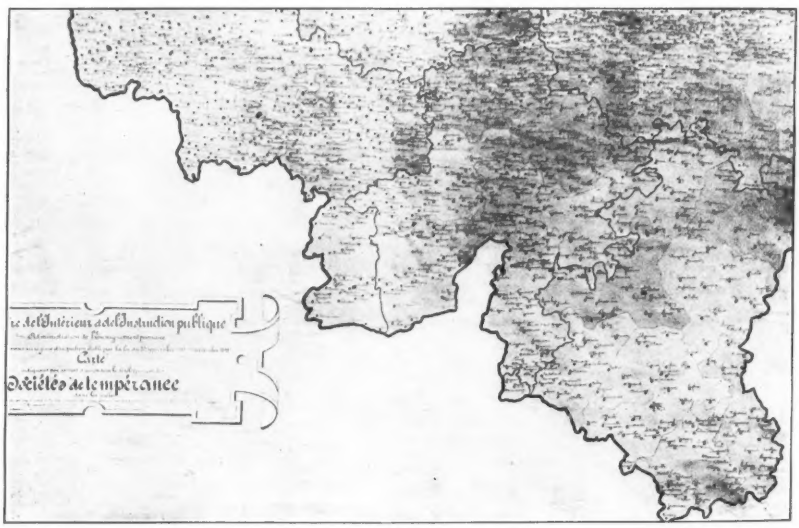
DECORATIVE GROUP, "MINER AND CHILD," BY CHARLES MULLIGAN.

It is surprising that only two or three of the great colleges have appreciated this vast field of usefulness presented by correspondence instruction.

The United States Congress appropriated one hundred thousand dollars for an exhibit at St. Louis in which should be brought together the work of the agricultural and mechanical colleges and experiment stations. A half side of the west corridor has been given up to this work.

In this department is a table which, like so many others, presents food for thought. It shows the federal aid granted to colleges of agriculture and mechanical arts, a total in land values of sixteen million dollars, in money of fifteen million dollars.

Michigan and North Dakota each have had over one million dollars; Alabama, but two hundred and fifty-three thousand dollars; West Virginia, but ninety thousand dollars; Georgia, but two hundred and forty-two thousand dollars. These inequalities occur through the division of the public lands throughout the states. They are none the less unequal, unfair and unwise. If there are public lands to be granted, they should be given to all of the states in proportion to population, and especially should the Southern states receive advantages of this sort. It is absurd, however, to make education depend on a land-grant of any



BELGIAN EXHIBIT—MAP OF BELGIUM PREPARED BY THE ADMINISTRATION OF PRIMARY TEACHING, SHOWING BY INSPECTION DISTRICTS THE DEVELOPMENT OF TEMPERANCE SOCIETIES IN THE SCHOOLS.

D. R. FRANCIS, PRESIDENT OF THE EXPOSITION, AND A GROUP OF DISTINGUISHED VISITORS ON OPENING DAY.

description. It should be direct, and especially should it be given liberally by the national government to those Southern states who have been weakest heretofore in this respect.

In this department, again, we are confronted with another map, this time of the world, which teaches a lesson. Little red circles represent agricultural stations. Throughout the entire extent of South America we find but ten stations. In the whole state of Texas, which is an empire in itself, there is but one. In some states there are none at all, and in only two states are there three. But looking at the map of Europe, we find it so thickly dotted with these agricultural experiment stations that one does not wonder that the average European acre produces as much as twelve of the American soil.

In the exhibit of Agricultural Colleges is a model of the test apparatus which is used to determine the relative values of food. Into this a beef steer is placed and kept for forty-eight hours. The food which he receives is carefully measured and all excrement from the body is likewise measured. The test-room being kept at a fixed temperature, the number of heat-units contained in the excreta is determined. The food contains the equivalent of a certain amount of heat. Measurement is kept of the heat-units which are lost by excreta, et cetera, and is compared with the heat-units in the food furnished. There is a certain escape of gases, each of which is carefully measured. The air from around the animal is constantly pumped out and passed through apparatus to determine the weight of the various gases. The combustible gases are burnt and measured in heat-units; the excreta also burnt and measured in heat-units. The conclusion of this test shows that there are certain heat-units which have disappeared, and the presumption is that these have gone into the fat and increase of the animal's flesh.

In another department of the agricultural work is a room for determining the composition of soils. These are taken first and put into a centrifugal machine and separated into clay, silt and sand. The clays and sands are quickly separated, and there is also a division composed of silt.

In this department is illustrated the importance of some of the problems which

ONE OF THE GREAT GROUPS OF STATUARY ON THE SLOPE FROM TEE FESTIVAL HALL TO THE GRAND BASIN.

concern the prosperity of the nation and which affect Wall Street. The question of destruction of grain, which not so many years ago was left entirely to the farmer, to-day comes under the closer supervision of government. Take, for instance, the problem of smut, the loss through which amounts to some millions each year. In the exhibit station we find the smutted wheat, in the grain of which the parasite in devouring the growth has reproduced its own species, till in a single grain of wheat there are possibly millions of spores produced. Grains of wheat in this condition, passing into the thresher, are crushed, the millions of spores distributed over the sound wheat, and so we have prepared seed for reproducing this disease the following year.

Under the directions of the Agricultural Department, the farmer knows now that by a very simple use of formalin he may destroy these germs absolutely and plant his crop with a feeling of entire safety. It would scarcely be believed that with this knowledge spread broadcast, there are farmers who are so ignorant or so careless as to refuse to treat their seed-wheat, but such is the case, although the number is rapidly dwindling.

Three foreign nations make memorable exhibits of their educational work—Germany, Belgium and Japan. As has been remarked elsewhere, Germany surprises one at every turn by the elaborate proofs she gives of her progress as a people in art, in industry and in science. But it is only when one reaches the educational exhibit of Germany that the reason for her progress as a nation is made manifest.

Commenting to the director of the German exhibit on the beauty of the later designs of New York schoolhouses—he was familiar with New York—he pointed to a beautiful model almost equal in design of the finest of the latest constructions in New York city and said, "We have two hundred and sixty-six of these in Berlin alone, a city of less than two millions of inhabitants, as against your New York with four millions."

And as for methods, here is an example: A large case in the German educational exhibit shows stuffed birds of many kinds of plumage, vases, helmets, skulls, books, et cetera. It is not much of a collection of animals, nor much of a collection of vases, so that one wonders why it is there. Herr Director explained: These are articles used in the public schools of Germany to be sketched by the students. In no instance is drawing taught from prints, as in so many of our public institutions, where it is possible for a child to make

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THE PALACE OF ELECTRICITY AT NIGHT.

marks which resemble other marks on the printed illustration without having the slightest power or idea to draw. But, the object itself placed before it, the German child is required to draw the real thing. Though the result be crude, it must be far beyond anything to be obtained from a mere copying of prints.

The German exhibit in education includes every article used in the entire school system of Germany—all classes of text-books, even down to copy-books, wall-scrolls, et cetera. I wonder if the Bureau of Education at Washington has appointed a commission to investigate these while they are presented in such compact form, and report in what respect they excel our American display.

Nor is the educational department of German exhibits without its showing of practical work. There is a large room in which lectures are delivered on Tuesdays and Thursdays. German ingenuity is shown in the construction of this room. The skylight contains a rolling shade which is moved by pressing an electric button and is closed after the audience has taken its seat in the amphitheater. That Germany has benefited by this exhibit is shown by an instrument used in the lectures, the epidiascope, upon which is inscribed, "Bought by the Washington University of St. Louis."

Comment has already been made on the beautiful entrances which distinguish the German exhibits in the Varied Industries Building. In the German exhibit in the Education Building there is another of these, this time an elaborately carved and exact reproduction of the entrance to Public School No. 147, in Berlin.

The German educational exhibit contains much of interest from every point of view. The student of history finds a reproduction of an ancient Roman castle, dating back more than nineteen hundred years, which has been restored by order of the emperor. In another place, elaborate exhibits are

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DEPARTMENT OF EDUCATION—EXHIBITION OF ACTUAL WORK IN THE EXPOSITION: MANUAL TRAINING FOR THE BLIND.

TERRACE OF STEPS LEADING FROM THE GRAND BASIN TO THE FESTIVAL HALL, WITH VIEW OF THE IMPERIAL GERMAN GOVERNMENT PAVILION

made through interesting photographs of plans of the work of excavation which the Orient Society of Germany is doing at Abusir.

An interesting study in university architecture is presented in another room which contains photographs of all the German universities.

Another section is devoted entirely to the technical schools of Germany, and still another to the medical schools. In this section is included also a display of medical apparatus, so extensive that it must be of immense value to American students interested in medicine and surgery.

The X-ray is exhibited in a room set aside for that purpose, and the apparatus is said to be the largest and most complete of its kind in the world. This is one of the most popular exhibits of the Exposition.

But it is reserved for Belgium to teach some of the greatest lessons in education. A photograph is presented with this article of a map which hangs in the Belgian exhibit, and which deserves the attention of all interested in education.

On this map is shown every schoolhouse in Belgium. Under each is indicated the number of students in the school who have signed a temperance pledge. In other words, Belgium as a state has recognized that liquor has in the past been the most deadly enemy of her people, and that the way to overcome this evil is by the careful instruction of her youth in habits of abstinence.

There are in the schools of Belgium one hundred and three thousand eight hundred and thirty pupils. Of these no fewer than forty-one thousand and thirty-four are members of the school temperance societies. Since the introduction of this plan in the public schools, no fewer than eighty-eight thousand nine hundred and seventy-six students have, before leaving school, taken the total-abstinence pledge for life. There are two thousand one hundred and twenty-seven schools in which there are societies for temperance.

It is to be regretted that these statistics

MISSISSIPPI EXHIBIT—STATUE OF "KING COTTON," MADE FROM THE PRODUCTS OF THAT STAPLE.

are partly of 1896 and partly of 1899, so that they by no means show the progress made up to 1904. As the beneficial effects of this work are becoming better understood, it has grown rapidly, and the figures now must be very much larger.

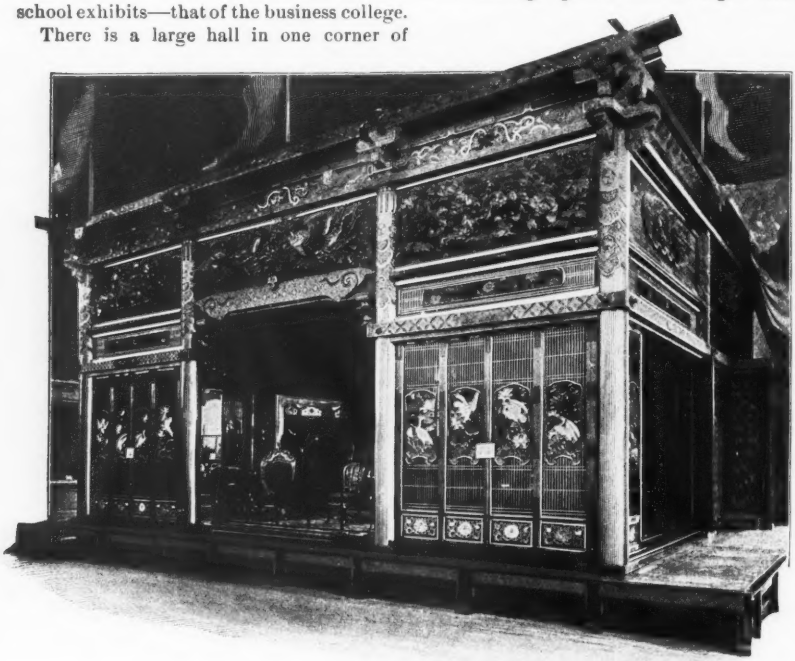
This chapter has already much exceeded the limits allowed in the original plan of thirty articles, intended to cover the Exposition. It must, therefore, be closed with a reference to one additional class of school exhibits—that of the business college.

There is a large hall in one corner of the Education Building, which shows the business college with its courses of typewriting, bookkeeping, et cetera, in full operation at certain hours of the day. It is a private institution, having fifteen branches scattered throughout the West; and fifty of its best pupils have been sent to St. Louis to take a sort of World's Fair postgraduate course, and at the same time exhibit for a certain number of hours the actual operations of a business college.

After going carefully over the system, I ventured the inquiry:

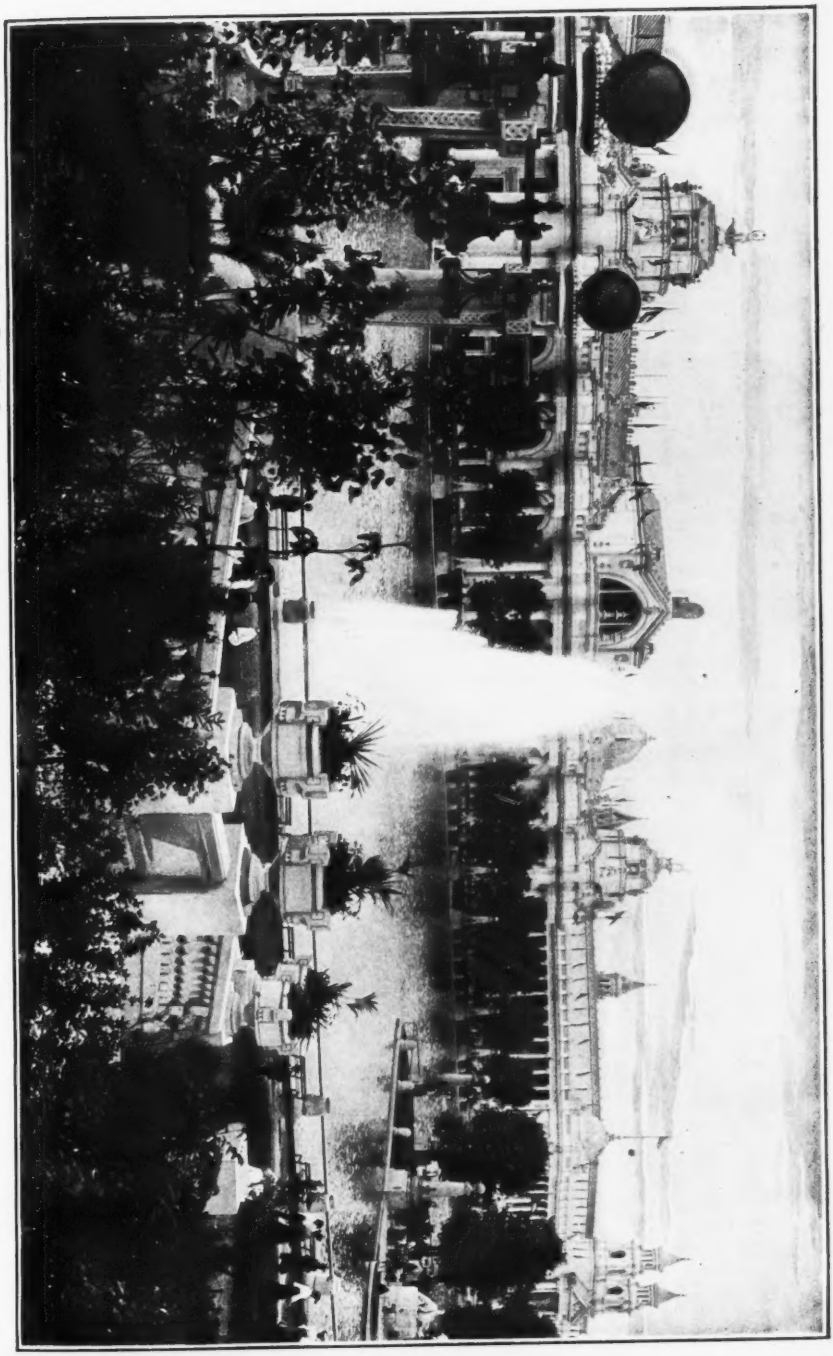
"Do you give a course in business morality?"

The look I received was one of surprise. Evidently the idea of a course in business morals as forming a part of a commercial education was a new one to the head of this institution—or rather, I should say, institutions. Then, after a moment's pause, he replied that that was an impossible thing to teach, that it had to be born through generations of right living.



MAGNIFICENTLY CARVED BOOTH OF THE JAPANESE EXHIBIT IN THE PALACE OF VARIED INDUSTRIES.

Yet if this proprietor of business colleges had taken a course in psychology at any of the leading universities, he would have learned that business morality is one of the teachable things. If he had been a real business man and had been at the head of establishments employing numerous young men, he would have been aware that of all things taught at business colleges it is the one thing above all upon which most stress should be laid. An hour a day would not be too much to give for lectures on business morality



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PALACE OF ELECTRICITY AND PALACE OF VARIED INDUSTRIES FROM THE CASCADE GARDENS.

and business ethics, if necessary to produce the desired result. Employing many young men, and having an opportunity to hear from others of their experiments in breaking youth into business life, I should say that about nine young men out of ten who fail are lacking in a high standard of business morality. This business morality may come in a lack of persistence in doing work well; it may come in a lack of willingness to do work at an important time; it may come in downright graft; it may come in a willingness to take advantage.

BELGIAN EXHIBIT — POSTAL SAVINGS-BANK BOOK USED BY SCHOOLCHILDREN AND WORKING PEOPLE.

There are a thousand ways in which it makes itself manifest, but sooner or later its presence is detected as certainly as a piece of litmus-paper placed in the soil shows the presence of the acid which turns it red. The young man presently finds himself out of a position. He knows that he is a capable man in many directions. He perhaps understands that he does good work; but he does not comprehend that this almost intangible something, known as Business Hônor, is at the bottom of the willingness to dispense with his services. The prediction may be ventured that before the next great exposition shall be held, business colleges will have progressed sufficiently to teach Ethics, or Business Morality, or whatever you choose to call those things which in reality do more to advance a young man to true success than mere proficiency in some special branches.

One word of summary before concluding. The visitor cannot go through the Exposition without being impressed with six facts:

First. That education is solving all the world's difficult problems. As men grow in knowledge, they reason about all manner of things, especially governmental.

Second. That nations like Germany, which have been increasing most rapidly in public facilities for scientific and technical education, are making the most progress toward industrial success.

Third. That the so-called classical education, where persisted in, as in Great Britain and Spain, tends to place in the background even the most powerful nations.

Fourth. That in the great system of state institutions so rapidly being built up in our middle West, which already exceed in the number of their students our endowed universities, lies the chief hope for the rapid extension of scientific instruction for the people of the United States.

Fifth. That governmental aid is absolutely and immediately necessary upon an extensive scale for those Southern states which have racial questions to solve. Industrial and ethical training can furnish a solution for this country of one of its most difficult problems; and nothing else will.

Lastly. That the education of men and women, carried on within their homes, is fully as important as the education of children. Interesting evening lectures, illustrated by the biograph, and a well-devised system of correspondence instruction should be placed within the reach of every ambitious citizen in the land.

BAND LEADING ATHLETES TO THE GROUNDS AT OPENING OF THE OLYMPIC GAMES.

V. THE STORY OF CREATION

ON THE PIKE.

By John Brisben Walker.

THE World's Fair should be regarded by the visitor as a university course which, being compelled to take in a few days, he must make the most of. He will be greatly assisted by a careful study of guide-books or of these short chapters prepared for the benefit of those of the million readers of The Cosmopolitan who have not yet visited the Exposition.

And the pleasure to be derived from the Pike and the amusement features of the Exposition will be the greater if taken after the serious work of the day, for it is then that the lighter side of the world shows at its best, the actors exerting themselves to their full effort, and the great crowds in themselves being not the least interesting part of them.

ON THE PIKE—THE ENTRANCE TO "CREATION."

One may take in the poor shows first and reserve the best to the last, or reverse the process. "The Boer War," undoubtedly the best, deserves an entire evening, and it is told of elsewhere. Next in interest, because of its wonderful variety, comes "Creation," novel in its conceits and giving illusions on so large a scale that the like has not before been attempted.

The first step into "Creation" is through the most artistic entrance-gates along the Pike, but is otherwise tame and gives no idea of what is to come. You embark upon a commonplace boat, and just as you might take passage with Charon on a new Styx, you glide into a darksome cave. From time to time tame stage-settings of scenes in foreign lands come out of the darkness and disappear as you pass on into the gloom again. You travel apparently a thousand feet and then your boat is drawn up to a landing. You disembark as Dante and his guide might have done, and are directed into a second cave, on the floor of which you feel comforting tan-bark, soft and cool under your feet. A turn brings you into a bright glare, and before you, on a slender stand, rest the head, bust and arms of an otherwise bodiless and legless woman. You can see behind and underneath the stand. You look in vain for a sign of those mirrors which you know produce this illusion No. 1. But there is not a crevice visible, nor the slightest change of angle in the wall-paper behind the stand. A fakir with a grave face and deep voice that would make his everlasting fortune as a humorous lecturer, handles lightly some bottles of perfume and declares that he will give

PHILIPPINE EXHIBIT—SPECIMENS OF THE WILD TRIBES. ANTONIO, CHIEF OF THE HEAD-HUNTING IGORROTES.

them away if you do not buy. "The lady on the stand is not really legless," he explains; "she is very much alive, and has all of her limbs; the appearance she presents is purely illusory. She does not speak English and she cannot understand what you say about the beauty of her eyes;" whereupon the rather pathetic face smiles, and some of the lookers-on make remarks not over-mannerly. And you wonder how hard life must have proved before this young girl accepted employment of the kind that puts her face up for the comments of a crowd just as the Coney Island negro holds his head in a canvas slot for any savage to fire a ball at. And you wonder where is the Society for the Prevention of Cruelty to Animals, and if perhaps under the harsh methods of competitive life it would not be greater cruelty to prevent her taking the salary she earns.

A little farther on, you find the veritable Coney Island negro, not with his head up for a target, but upon a pitch-fork, with two tines of the fork running right up into the neck and all the rest of his body missing. But here the crowd is not so great as at the stand with the pretty girl's head. Either the novelty is lost or the pretty face is more interesting.

A crowd is gathered about a well-curbing, and you climb up and await your turn to look down. There is another negro calmly resting eighty feet below. This time, however, you perceive a reflection which indicates a mirror placed at a 45° angle, and you are quite sure that the darky boy, instead of being eighty feet below you where you distinctly see him, is in reality only four or five feet lower than the level of the ground, but at the end of a horizontal tunnel which is just as long as the well seems deep.

You are now prepared by these and several minor illusions for the grand climax of this illusionary world, and are invited to climb up a dark staircase. When you come once more into the light, you behold a fairylike scene. Boats filled with gaily dressed voyagers are moving rapidly through a deep canal. The banks of the canal are lined with canvas cities. Venice and Rome pass in succession. In one boat a band of troubadours is singing an Italian song to guitar and flute accompaniment.

A GROUP OF NORTH AMERICAN INDIANS.

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GENERAL VIEW OF THE FIKE.

GATEWAY TO "FAIR JAPAN" ON THE PIKE—A REPRODUCTION OF THE FAMOUS PORTAL AT NIKKO.

As you reach this upper world, you step upon a circular moving platform about six feet wide, which seems to move inside another and broader circular platform bordering the banks of the canal, and having upon it seats and columns and a roof to protect you from the sun in the daytime and the dews at night.

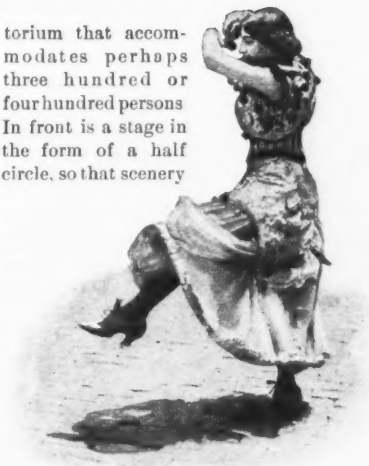
You step alternately from the moving to the stationary platform; then you stand on the moving platform and make the complete circuit, apparently, admiring the beautiful buildings which adorn the opposite bank of the canal for some ten hundred feet in length. You watch the boats go by, and you have a desire presently to join one of the merry parties on the canal. But you search in vain for a landing-place. "This way for the boat-landing," a guide calls, standing at the top of another dark staircase. Down you go, and follow to another staircase, which you ascend, and lo and behold you are in the center of a boat, and there are others, and the boat glides through the waters of the canal, while behind gaily paddles a flock of ducks.

How jolly! How swiftly the boat moves past the roofed platform on the left and the painted ancient cities on the right! But on a pole over one of these cities—the pole is in a neighboring show—shines an electric light. How strange—the position of the light with reference to the boat does not change! It is as immovable as the north star. What can it mean? And then of a sudden it comes to mind that you have come up into the boat through a staircase, passing up through the waters of the canal into the bottom of the boat. And one doesn't ordinarily come into a boat in this way, unless perhaps it be the ghosts that arise from Davy Jones's locker. Then suddenly you smile to yourself and the idea begins to dawn upon you. All the cities on your right are revolving in a circle. The great platform on your left, with its columns and roof and latticework to aid the deception, is also moving rapidly in a circle. Both are on wheels, but as these move under water there is no grind and creak. Your boat is built down safely to the lower floor. Only the ducks paddling

idly behind — you thought they were swimming swiftly to keep up with the boat's motion only a minute ago—are free to navigate. And there is still the north star to starboard, fixed and immovable, while the beautiful palaces on the water's edge pass in stately review.

No wonder now that you did not discover the landing-place, or that your boat did not come up with that in which were the troubadours! The most perfect illusion I have ever seen, so complete indeed that my companion was disposed after returning to the stationary platform to argue that this platform was the moving one. An ingenious, carefully wrought-out scheme of illusion that leaves the brain in a whirl of delight and doubt. But not yet was the end of this performance. Presently, after the manner of the journeying of the great poet, we were guided out of darkness to still another gate and bade to wait until its portals should open. Within was a great shuffling of feet, dwindling gradually. Then a gate was thrown back and we were not ordered to enter, but heard the modern cry of "Take your time, ladies and gentlemen—seats for all!"

The crowd hurries up a steep amphitheater—the open gates are immediately below the stage—and finds seats in an auditorium that accommodates perhaps three hundred or four hundred persons In front is a stage in the form of a half circle, so that scenery



A SPANISH DANCER ON THE PIKE.

fitted to turn around its periphery can be moved back along the lines of the interior and exterior circles. A red-baize screen moving in like manner serves as a drop-curtain. On the other side of the dome —that is, in the rear—is a fine organ. The audience continues to arrive from the underground pits and from the canal and its illusions, until presently it becomes

PHILIPPINE EXHIBIT—TRIBAL DANCE OF THE IGORROTES.

only a straggling one or two. Finally, when no more come, the gates again close.

On my left are a pretty married woman and her husband—he looks like a bank cashier, or a manager of a prosperous business. She is evidently a woman of cultivation and refinement. But they are out for a holiday. They are both full of life. He begins stamping and she begins clapping her hands rhythmically. So suggestive is rhythm that presently, in a minute, half the audience is going stamp—stamp—stamp—stamp, stamp; until above this roar indicating good fellowship and holiday manners is heard the low pealing of the organ—solemn, sonorous—a deep diapason thrilling the heart of the multitude—pulsating, vibrating, stirring the most savage breasts.

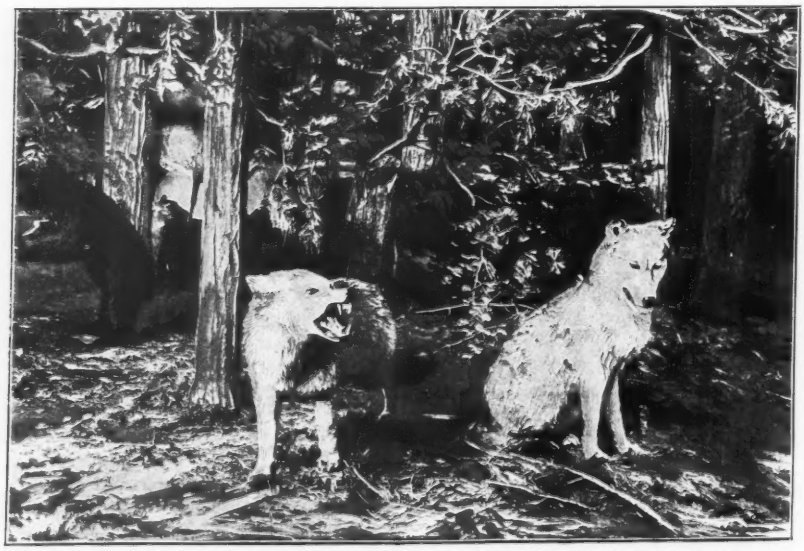
The red-baize screen rolls on circles to the sides until it disappears, and from off in the distance comes the chanting of an invisible choir.

"Let there be light." The first day of creation has come. Strangely tinted clouds rush with bewildering rapidity across the dome. The earth moves out of chaos. From the ends of the stage, on other circular tracks, new scenes are rolled forward.

"The waters cover the earth." Islands arise as if by magic from the seas. Lightnings fork in the heavens—not flash, but spring down out of the sky in blinding strokes as vivid as in any storm on the Hudson. A volcano opens its crater with a thunderous explosion and sweep of gases like unto Mount Pelée. Molten rivers rush down its sides.

Another day of creation; now the heavens are calm and smiling, and forests appear, and there is life on the earth. And finally another scene rolls on its circular track to the front. A lifelike figure of a man is seated on a rock; his arm rests on a moss-covered ledge; he neither moves nor breathes—he is painted there, you think. The organ rumbles slowly and mysteriously; a figure is seen coming forward through the grove. It walks as if in a strange land. Suddenly the advancing Eve looks down on the figure of the young man on the rock; there is the light of coquetry in her eyes. Adam looks surprised, curious; then jumps forward, holding out his arms appealingly. The world has been created and life has begun in earnest.

Another set of gates opens below. "This way out," calls a stentorian voice. And the audience wakes up to grope its way forth into the noise and bustle and lights of the Pike.



A SAMPLE OF THE ATTRACTIVE EXHIBITS IN THE FORESTRY, FISH AND GAME BUILDING.

VI.

WOMAN'S PROGRESS SINCE THE WORLD'S FAIR AT CHICAGO.

By John Brisben Walker.

EMERSON, in his essay on "Manners," wrote: "Our American institutions have been friendly to her, and at this moment I esteem it a chief felicity of this country that it excels in women. . . . Certainly let her be as much better placed in the laws and in social forms as the most zealous reformer could wish. . . . By the firmness with which she treads her upward path, she convinces the coarsest calculators that another road exists than that which their feet know." And having quoted this much, I cannot refrain from giving also this which follows: "Are there not women who fill our vase with wine and roses to the brim, so that the wine runs over and fills the house with perfume; who inspire us with courtesy; who unloose our tongues and we speak; who anoint our eyes and we see?"

It is not too much to say that in the eleven years since 1893, the position of woman has changed more radically than it had before in any hundred years of the world's history, and there has been an amount of clear thinking and just writing regarding her, greater than in all time since the Queen of Sheba.

As a consequence, there is no attempt at St. Louis to segregate the works of women into a feeble exposition as was done in the Woman's Building at Chicago. In the St. Louis collection of the productions of all nations, woman takes her place on her merits with man. She is part of the body politic. She is a recognized voter with full rights of citizenship in certain states. She has received in those states the same protection as to property and in the administration of the law that man has. Everywhere the justice of this rearrangement of rights has been accepted. In many states there are movements on foot looking to the early passage of laws which make woman a citizen in the enjoyment of the fullest rights contemplated under the original declaration of our liberties. Having a vote, woman

GERMAN HOUSEHOLD ART EXHIBIT.

will be able to help her unfortunate sisters, to rescue the governments of the cities from corruption and to take an active part in the upbuilding of juster ideals for both women and men.

The distinct progress made by woman since the Chicago Exposition may be classed along six lines:

First: Admission to complete rights of citizenship in several states.

Second: Fully recognized admission to all the occupations—business, factory and professional.

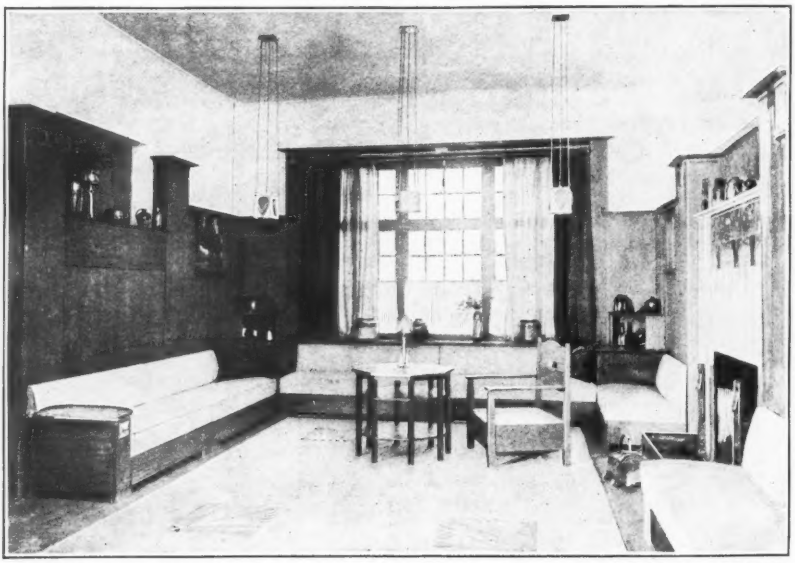
Third: The removal of the education of women from the field of the namby-pamby and the ornamental to that of the useful, beginning with household economy and extending into the highest branches of science.

Fourth: The acceptance of motherhood as a profession, requiring thorough recognition of the fact that it brings woman's highest reward.

Fifth: The contribution during the past eleven years of an immense deal of careful thinking, placed in book form, regarding household duties, household management and methods of correct living, and, generally, the bringing of all those things which were formerly left to tradition, and were often the results of the grossest ignorance, up to a plane of scientific accuracy.

Sixth: The invention within eleven years of an immense number of household conveniences, calculated to save the labor of the housewife and to make work interesting and agreeable.

Take, for instance, some of the things which have been done in the direction of the lightening of household duties, while the operations themselves have become perfected. An ingenious bit of mechanism removes dust from the walls and floors without in the least exposing the lungs of the operator. The modern house will have dust-pipes running to each room from the cellar, just as in many there are steam-pipes running from the cellar to the bedroom. There will be a small exhaust-fan in the cellar, turned on at the convenience of the housewife by an electric switch. In the bedroom the housewife will attach a hose to the stationary dust-pipe, place the end of the hose against the wall or the floor, and the exhaust-fan in the cellar will do the rest.



GERMAN ARCHITECTURAL EXHIBIT: A LIVING-ROOM DESIGNED BY PROF. MAX LÄNGER, OF KARLSRUHE.

The washing of dishes, as is told in another chapter, is no longer the bugbear of ancient days, with its pan of soapsuds,

GERMAN ARCHITECTURAL EXHIBIT: A CHILD'S BEDROOM DESIGNED BY ARNO KÖRNIG, OF BERLIN.

in which the hands of the housewife are coarsened. The mechanical cleaner is described elsewhere. For milk-bottles and table-glasses there is another machine: pigeonholes receive the glassware and a revolving wheel brings the objects into contact with water, steam and brushes, until all are cleansed.

But having got rid of those bugbears, scientific invention is alert to a more critical part of housekeeping. The man and woman of 1910 will no longer be at the mercy of the cook whose knowledge either is crude or has been acquired in schools so different from those to which one is accustomed, that eating becomes four times out of five an unsatisfactory function instead of a pleasurable feast that gives reward of perfect digestion, with its complement of health.

At the time of the Chicago Exposition the idea of putting a cook-stove on the dining-table had not been thought of. At St. Louis the electric cooking-stove is exhibited in many varieties, and so perfected that we can easily behold in our mind's eye the New York breakfast-table of 1909—the date of the great exposition which should be held in that city to celebrate the 300th anniversary of the coming of Hendrik Hudson into New York Bay.

A neat nickel-plated slab is placed on the table just touching the breakfast-plate: under this a thin marble slab to protect the table. A silken-covered wire comes down from the electric light overhead.

NEW DESIGN FOR CHATELAINE BAG.

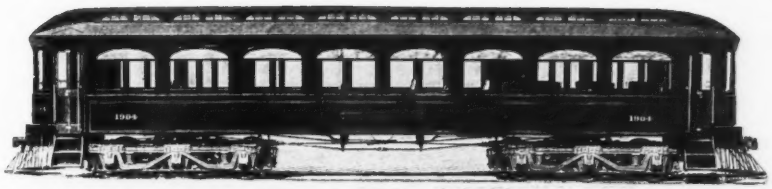
Just alongside of this is a small coffee-urn, also electrically fitted. A mutton chop, a couple of eggs, some ground coffee in a sealed jar, a bottle of cream, butter, pepper and salt stand round about in a delightful array, and in a dish two peeled potatoes. The switches are turned on. The two eggs are broken in a small porcelain-lined shirring-dish. With a small sharp knife the potatoes are cut in exact slices, the thickness of a silver dollar. In a flat pan, provided with a low rim, are placed the chops, and this in turn is placed on the nickel-plated slab. The morning paper being near at hand, the housewife, who is now truly the autocrat of her breakfast-table, proceeds to look over the news columns. From time to time she glances at the chops, which begin to emit appetizing odors. As the chop approaches that juicy condition when it bids fair to be done exactly to a turn, she lays down her paper to drop the sliced potatoes into the hot butter sizzling in the smaller dish.

The sealed bottle of coffee is opened, and with an exact measure she fills out the coffee required for two cups. This she places in a bag and into this empties the bubbling water from the lower part of the urn. She knows that she will have that perfect coffee which the Brazilians, those masters of the art, take from a sealed bottle and prepare with absolute exactness. I am speaking by the card, because the chief of the Brazilian exhibit took me into his kitchen and had prepared for me a cup of delicious coffee while I waited. That part of the urn into which the coffee drops is surrounded by a hollow jacket filled with heated water, thus preserving the temperature of the dripping coffee. From time to time her husband glances from his paper to the delicious bit of cookery, noting in what a perfect way each part of the breakfast is being cooked, and satisfied that everything will be done to perfection. The breakfast has been a cozy tête-à-tête affair, because no servants are required. He holds his own plate while his wife places upon it his mutton chop, a portion of the shirred eggs and the sliced potatoes which are taken from the hot butter, done to a light brown. Then his cup of coffee comes hot from the urn without a moment's delay. There has been not a particle of waste.

The food was so appetizing that it has been eaten to the last slice of potato. Knowing the amount required for health, there has been no more cooked than was required. No expensive range has been kept heated since five o'clock in the morning. There has been no sending away of food because it was cold or badly cooked. A chef at five thousand dollars a year could have done no better.

Yes, the introduction of scientific methods, the elimination of waste and the perfection of labor-saving devices mean the emancipation of woman from drudgery, mean leisure for her to take part in behalf of good government and time to develop her mind by good reading.

TELLING FORTUNES IN "JERUSALEM."



THE LATEST DESIGN OF CAR USED ON INTERURBAN ELECTRIC RAILWAYS.

VII. TRANSPORTATION IN 1904.

THE PROGRESS MADE IN THE CARRYING OF PASSENGERS IN THE LARGE CITIES HAS BEEN GREATER IN THE ELEVEN YEARS WHICH HAVE FOLLOWED THE CHICAGO EXPOSITION THAN IT WAS IN THE PRECEDING FOUR THOUSAND.

By John Brisben Walker.

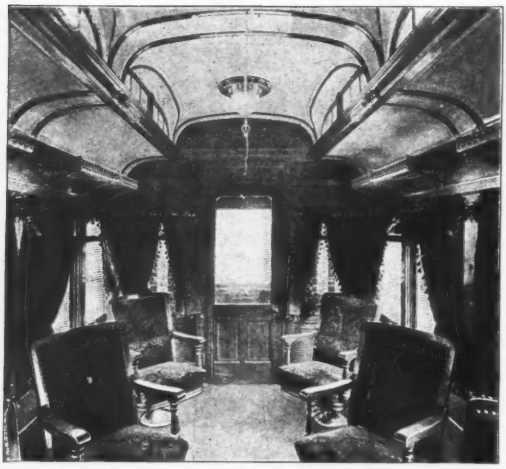
As one stands in the middle of the great building, covering sixteen acres, which is entirely devoted to transportation, the mind is confronted by the striking contrast of past and present. On one side of the aisle are the ancient races, with their donkeys, paniers, camels, oxen and chairs with their motive power of human legs. There are fifty varieties of conveyance—some with wheels cut out of solid trees; primitive sleds with runners equally clumsy; cheaply woven bags for carrying goods on animal-back—accurate reproductions of the simpler forms of transportation from the backwoods and the desert, including a bullock-cart made all of wood and thongs, into which no piece of iron enters.

Just across the aisle, by contrast, is the latest pattern of the highly developed automobile. In it are plate-glass windows with silken curtains, luxurious arm-chairs, a writing-desk, a movable wash-basin, ice-boxes, closet, electric light. The roof is of polished maple-wood. There are press-buttons and telephone for communication with the driver—in a word, everything that luxury can suggest. The cost is eighteen thousand dollars, and the forty-horse-power engine will drive this private family car along a highway at the rate of forty miles an hour, without other aid than a little gasoline actuating a mass of the most ingeniously contrived machinery that the world has ever known.

But it is not necessary to go back to the camel which stands across the aisle from the automobile, and to the days of Solomon, to reckon the changes of the time. The contrast between Chicago in 1893 and St. Louis in 1904 is sufficiently startling. In fact, there has been more change in the most important forms of transportation in the eleven years which followed the Exposition of Chicago than in the previous four thousand. If there was an automobile at Chicago, I, who am largely interested in transportation, and wrote the article on that subject for The Cosmopolitan's World's Fair edition, did not know it. There may have been one, but I very much doubt it. If an automobile of any kind was exhibited, it was simply so crude a device as to attract no one's attention to it.

The electric car at Chicago was a little

AN AUTOMOBILE MAIL-WAGON.



INTERIOR OF A PALACE-CAR USED ON INTERURBAN ELECTRIC RAILWAYS.

affair very much resembling the old horse-car in its small dimensions and its discomfort. On one of the tracks in the Transportation Building at St. Louis stands an electric street-car almost as finely equipped as the modern Pullman. Rounded glass ends protect the motorman; luxurious cushioned arm-chairs invite the passengers. There is even a private compartment which any exclusive who finds his vacant mind soothed by traveling alone may hire and so cut himself off from human intercourse for the period consumed in the trip. It is said that there are even sleepers on the electric lines running in the state of Indiana, but to my disappointment I found that these were not in the Exposition.

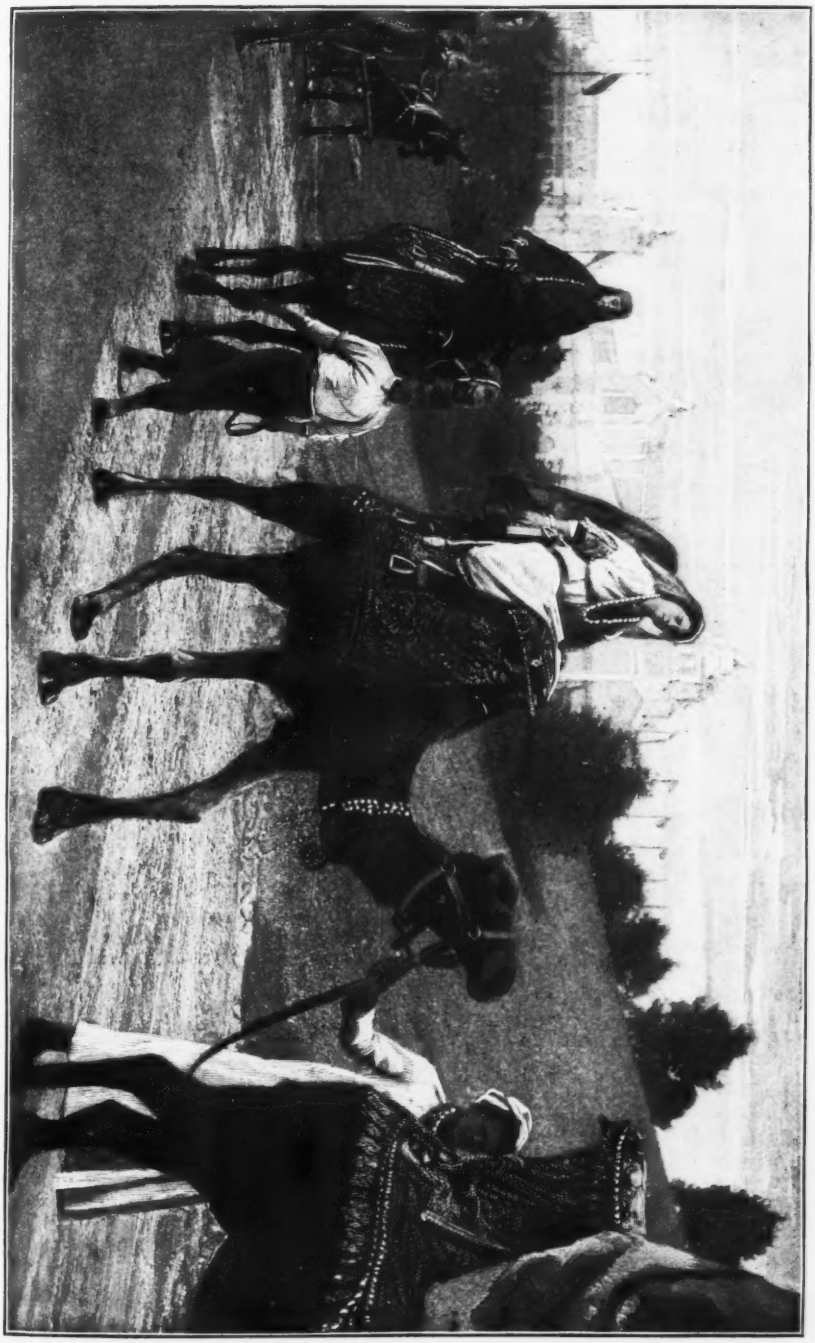
On one platform stands an early design of the automobile. It goes back far enough to have been exhibited at Chicago, if the owner had thought it worth while. But in those days the inventor of that machine was doubtless looked upon as a crank, and his neighbors felt a compassion for the man who could devote hours in the direction of such an unreasonable proposition as a self-propelled road vehicle; unless perhaps he was a Swedenborgian—for Swedenborg predicted both the automobile and the air-ship. This machine has high, thin wheels, very likely taken from high bicycles of the olden days. It looks ridiculous in form and absurd in principle. It no more resembles the automobile of to-day than a jelly-fish resembles its antitype the brook-trout; but there it is to reflect credit on the bold mind and courage of its inventor, and to distinguish him as a man who had not only the power to foresee, but the courage of his convictions. Some day this type of honorable man will get its due. To-day it seems to be in abeyance.

Gathered around the quaint high spindled wheels of this original automobile, are now one hundred types of modern machines.

It is said that more ingenuity has been exercised, more mechanical problems have been solved, in eight years of automobiles than have been thought out between 1818 and 1904 in relation to railway carriages.

The Fair is notable not merely for its exhibit of the highest construction of automobiles, but for the practical use of the vehicle itself. Sixteen passenger-vehicles traverse the ground in every direction, and also carry passengers from the city out to

EXPERIMENTS IN AERIAL TRANSPORTATION. PULLING ON ROPE ATTACHED TO THE PILOT BALLOON.



ORIENTAL METHOD OF TRANSPORTATION. A CAMEL PROCESSION THROUGH THE FAIR GROUNDS.

the Exposition. I went home in one of them one night and had an opportunity to learn something of the speed of the great vehicle. Turning off into the asphalted streets of St. Louis—it was eleven o'clock and the streets were deserted—the chauffeur put his vehicle in the center, applied all speed and carried his eighteen passengers along with a rush that I confess made me uncomfortable, fearing that something might come unexpectedly out of one of the side avenues. We turned into a number of streets and delivered passengers, and then finally reached the Planters' Hotel in a time that would have been impossible for the street-car. There was thorough ventilation, there were upholstered seats, there was comfort, there was quick delivery, and finally there was delivery directly to one's own door-step.

PRESIDENT FRANCIS APPARENTLY ENGAGED IN AN AFFAIR OF HONOR, WITH HON. JOHN HAY AND F. J. V. SKIFF AS SECONDS, ON THE ATHLETIC FIELD.

At Chicago there was the intramural electric railway for the first time, and it took New York nine years to copy this new development in transportation. So now this new style of transportation will be slow of introduction. The substitution of this latest means of travel for street-cars would be instantaneous were it not that it would interfere with some two thousand millions of capital invested in existing systems of street transportation.

On the other side of the building from the camels and the jackasses and the Indians leading their laden animals, and the covered carts and palanquins, and in juxtaposition to them on the north as the automobiles are on the south, is the modern railway-car in its highest form of development. The center of the Transportation Building is an exhibit of an unusual character in railway movement—a turn-table in operation and mounted high, and above it a locomotive, its wheels in full revolution, its power being used to drive the turn-table in an eternal circuit.

The most modern car, the most luxurious equipment, the most novel forms, are all to be found here, while in still another row to the north is a line of locomotives of three-quarters of a century ago, representing all the then ingenious forms, but now seeming crude and impossible. There are locomotives beginning with Stephenson and running on up through each of the developments as made on the Baltimore & Ohio and on the Pennsylvania Central and in Mississippi and finally in Illinois. Uncouth, crude, dangerous, they were for ten, twenty, fifty years, and yet here is the American mind in 1894 that takes hold of the automobile problem, infinitely more complex, subjects it to the most perfect scientific analysis, applies to it its most highly developed brains, and within eight years reaches a form that seems almost to compare in its final development with the

best in railway transportation of to-day. If you do not think so, turn to where are exhibited the chassé and the open work of the modern automobile, undoubtedly the most perfect mechanical work of man.

The fastest locomotive on an American road at the time of the Chicago Exposition is now so far away from the most recent development that its work is that of drawing a milk-train.

One marked feature in transportation since Chicago is the rapid introduction of steel for nearly every kind of car service. If the steel-manufacturing interests of the country had not been in the hands of men engaged in stock speculation, this development would have been far greater. The ruin wrought by the Carnegie stocks is not by any means confined to those who foolishly invested in those insecurities, but it explains the blight over all forms of progress into which steel enters. Fireproof buildings and fireproof cars are equally essential to modern life, but notwithstanding the excessive prices at which steel has sold for many years, one finds in the Exposition that steel is gradually taking the place of wood, because, even at its unduly high price, it furnishes the cheapest form of construction for moving both passengers and freight.

A CHIEF OF THE NEGRITOS, THE PHILIPPINE ABORIGINES THAT ARE RAPIDLY NEARING EXTINCTION.

A freight-car of the Chicago World's Fair era carried fifteen thousand or twenty thousand pounds. The steel freight-car of to-day, as shown in the Exposition, carries more than one hundred thousand pounds.

With the exception of refrigerator-cars, no wooden freight-cars are exhibited at St. Louis.

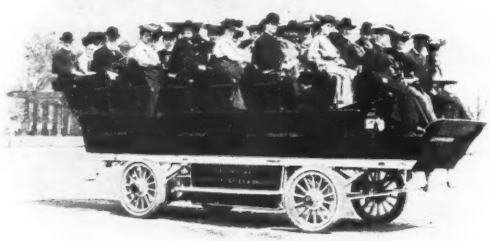
Still another development at the Exposition, in contrast with that of Chicago, is the automobile boat. At Chicago we had the electric launch, to the great delight of thousands; but there was not a single

VISITORS FROM SYRIA, EXHIBITING THEIR CHIEF MODES OF TRAVEL.

COURTYARD OF THE AUSTRIAN PAVILION.

gasoline-engine boat exhibited there, so far as I know. To-day the rivers and harbors around New York are dotted with these in every direction. They have become an important element of sport, and there is every reason to think that there will be a development in the way of water-carriage that will dot the rivers of America with little boats plying to and fro as the sampan does in the waters of China and Japan. They have become also an important engine of warfare, with their rapid speed and ability to deliver a torpedo with the best effect.

Still another development in this direction is the freight-carrying automobile truck. From time to time during the past fifty years, it was believed that it was possible to carry freight over ordinary roads in a steam-car without tracks. But so conservative is the human mind and so stupid is capital—that is, capital on a large scale, because people with small capital have no right to engage in such enterprises—that at Chicago there was no automobile truck corresponding to our idea of such a vehicle to-day. Now, all over the world the best mechanics are engaged in working out the problem. Not only this, but legislators everywhere are awaking to the fact that good roads mean easy traction, that easy traction means increased profit on crops, and that this in turn means valuable lands. The exhibit of this class of car is surprisingly small at St. Louis; it should have been one of the most notable. Steam, gas and electric freight-carriages of every kind should have been brought together, and had the exhibit in this direction been complete, it would have been worth much to the American mechanic.



PASSENGER AUTOMOBILE USED IN THE FAIR GROUNDS.

MODEL FACTORY BIOGRAPH EXHIBIT: HOW THE GIRLS ARE TAUGHT COOKING.

VIII. WORLD INSTRUCTION IN PICTURES.

HOW WESTINGHOUSE AND PATTERSON USE THE BIOGRAPH.

By John Brisben Walker.

TWO men conceived the idea of preaching to the public at the World's Fair in pictures. These were Mr. John H. Patterson, of Dayton, Ohio, and Mr. George Westinghouse, of Pittsburg. The invention of the kinetoscope which made this possible marks one of the distinct advances since the World's Fair at Chicago. It is a wonderful instrument that does not seem to have been fully appreciated from its educational point of view. So many schoolmasters still hold to the ancient theory of education through difficult and slow methods, that we are not surprised at the failure to recognize the extraordinary qualities of the biograph for public instruction.

It was fortunate, then, that two men, each so noted in his own work, should have given the schools these object-lessons in the use of the biograph which we find at the Louisiana Purchase Exposition. One of these exhibits, that of Mr. Patterson, is not only an example for the directors of our public schools and especially of the public-lecture system for teaching adults, but, more important still, such a lesson for the manufacturers of America as is calculated to produce wide effects.

Mr. Patterson's factory-operating work was of a kind entirely unknown in 1893. The Cosmopolitan set the example after the World's Fair at Chicago of putting up a classical building in beautiful surroundings. Whether or not Mr. Patterson got his first idea from that is of no consequence. At all events, he has improved upon it until to-day he is teaching the

MODEL FACTORY BIOGRAPH EXHIBIT: HOW THE GIRLS GO UP-STAIRS.

MODEL FACTORY BIOGRAPH EXHIBIT: HOW THE CHILDREN OF EMPLOYEES ARE TAUGHT GARDENING.

world in factory practice. Having achieved a large independence in fortune, he is now making it his delight to see what he can do for the surroundings of his employees, both in the workshop and in their homes. The time will come when it will be the chief pleasure of the enlightened manufacturer to do this; and the fellow who does not will be called a curmudgeon and a Scrooge.

But his factory being away off in Dayton, Ohio, not much is known of these new methods. Occasionally some clippings get into the press about them. Few manufacturers, however, have taken the trouble to inquire regarding their operation. A little while ago Mr. Patterson had some trouble with his employees, and great stress was laid upon this as showing that no matter how much a man may do, his work will not be appreciated. However, the matter was quickly settled, and it only illustrated to what extent, even in the best plans, the human element always enters, and also that there is liable to be misconception, perhaps on both sides.

Undoubtedly what he is doing for the men and women in his employment is splendidly appreciated, and, whatever any one may write to the contrary, there can be no question that honest, intelligent effort in behalf of employees always receives generous appreciation at their hands.

At the World's Fair this Dayton factory is shown in a handsome lecture-room, where four hundred biograph pictures are thrown on a screen, the figures almost life-size and all in natural colors. Every time I passed this pavilion during the busy hours of the day I found it crowded with attentive listeners.

Mr. Patterson claims that his exhibit is for employees, one thousand of whom he will send on free excursions to the Fair; but that is not the real work which his efforts are accomplishing. Its good effects will find lasting results among the manufacturers of the world.

The power of the biograph for the teaching of lessons has also been seized upon by Mr. Westinghouse. In its exhibit in the Machinery Building there has been erected by the Westinghouse Company a lecture-hall so large and handsome that with its three hundred and twenty-six chairs on the main floor it might well be the leading theater of a small city. The arches and vaulted dome which are used to exhibit the several kinds of electric light, are architecturally beautiful, and across one end of the hall is a handsome stage.

In the gallery, in the rear, is placed a biograph, and during the day great crowds come and go, watching the pictures, which are thrown life-size upon a screen, and are in several respects among the most remarkable ever taken.

They give the inside of a great factory in which more than eleven thousand men are employed. In such an establishment it

is not possible to admit visitors. They would interfere with work, and it would require a great corps of guides to take them in charge. Yet the whole world has a curiosity regarding these great establishments of which we hear so much in the newspapers. The Westinghouse biograph pictures gratify this curiosity in a way that is even more attractive than would be a trip through the factory.

It was a bold idea, that of showing eleven thousand men at their work, and it was carried out in an ingenious manner. Sixty-four Cooper Hewitt lamps were arranged on a traveling-crane. Suspended beneath a second crane, moving at a uniform distance from the first, was placed the biograph. As these tandem cranes moved down the great buildings, the pictures taken showed the men in every operation of their work. One gets an idea of the endless kinds of machinery which are being turned out, and of the earnest industry of the average mechanic in these great buildings. And when one sees a locomotive and a train of cars moving inside the building, the size of it all becomes apparent.

Another scene from another building not only presents the story of a day's work, but is a great piece of art. It presents a modern forge, and is striking in its artistic aspects. Only the previous day I had been inspecting the paintings in the German section of the Art Galleries, and had come across a picture which was called a masterpiece. It showed men at a forge. Arms were raised, sinews stretched, hammers about to descend. It had the advantage of color. But this forge scene, under the biograph—how different, although only in black and white! How tame the great painting in comparison with this living picture!

Around the forge are gathered a dozen workmen. A great ring for a fifteen-foot dynamo is being heated. You see the flames leap by flashes into the air. Men watch the iron turning to cherry-heat. As the crucial moment arrives, four welders seize their hammers. The ring is lifted by a crane out of the furnace. The four heavy hammers jump forward to do the work of welding. They strike with an energy that shows there is not a moment to lose before the iron grows cool. Blows descend, sparks fly. One man is struck on the thigh, through accident, by his neighbor's hammer, and limps off apparently with a broken leg; but notwithstanding his suffering, knowing that the extra hammer is needed, he braces up, steps back and helps finish the work.

MODEL FACTORY BIOGRAPH EXHIBIT: HOW THE EMPLOYEES LUNCH FOR TWENTY-FIVE CENTS A WEEK.
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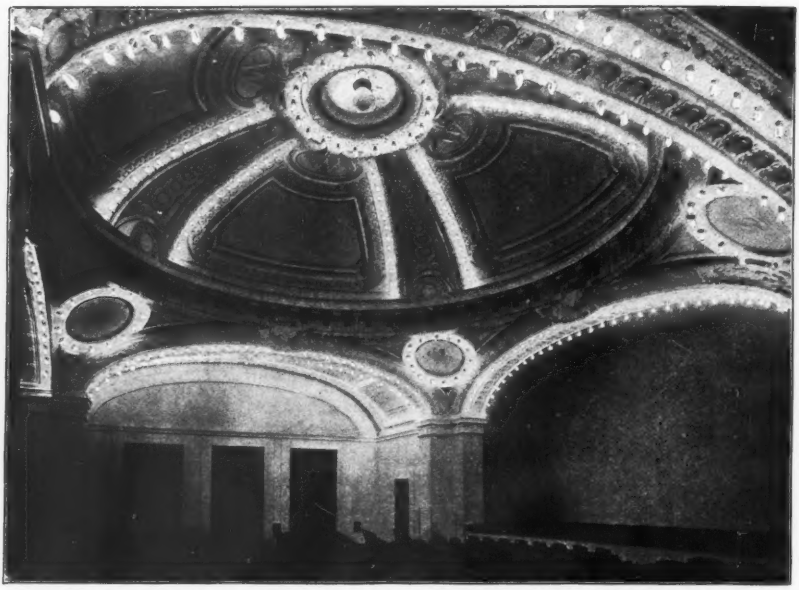


LECTURE-HALL, SEATING OVER THREE HUNDRED PEOPLE, ERECTED IN THE PALACE OF MACHINERY BY THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY FOR THEIR BIOGRAPH EXHIBIT.

Again the immense forging is put back in the fire. You behold the flames leap up while the workmen stand around for a moment's rest until the necessary cherry-color is reached. Then they seize upon the great ring forging, withdraw it from the fire, and swing it under a steam forge-hammer. It is all done so quickly, with such exactness and thoroughness, that you feel a pride in the intelligence of the American workingman.

Another scene in biograph pictures shows six hundred girls putting up their time-checks and passing out of the factory. It is an impressive exhibit of the American girl at her best.

But the Westinghouse exhibit has in reserve for you an even more remarkable scene. A single film holds no fewer than four thousand portraits of men and women, undoubtedly the largest picture as to numbers ever produced. These four thousand were gathered behind the doors of one section of the factory, and when the biograph was in position the doors opened. The scene for a few moments resembles that of a hive of bees swarming. Then, as the crowd which had been jammed against the door separates, the workingmen come more slowly. They are a fine-looking lot of fellows, and they carry themselves with an energy which shows why America has been so successful in its production of the finest machinery.

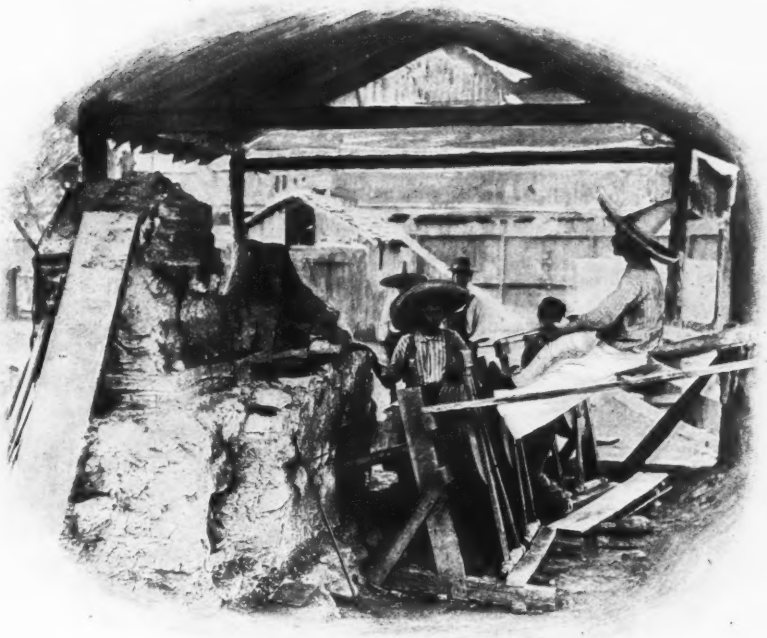
The film finally reaches its end, and now an inscription is thrown on the screen:

"Louisiana Purchase Exposition, 128 acres of floor space.

"Westinghouse Factories, ... 140 acres of floor space."

And in a second the mind has made a comparison better than could be conveyed by a page of reading-matter.

It is to be regretted that the biograph story of the Westinghouse factories does not tell of the beautiful location and the care for employees which is shown in the Patterson factories. The houses of the Westinghouse employees would not compare favorably with those of Mr. Patterson, but Mr. Westinghouse is a man of patient study and fine desires, and as he is only of middle age, we may expect that before his death the problem of providing for the workingmen will be as well worked out in his factories as the problem of economical mechanical production.



THE MEXICAN MINING-CAMP. PRIMITIVE BLAST-FURNACE FOR COPPER-SMELTING.

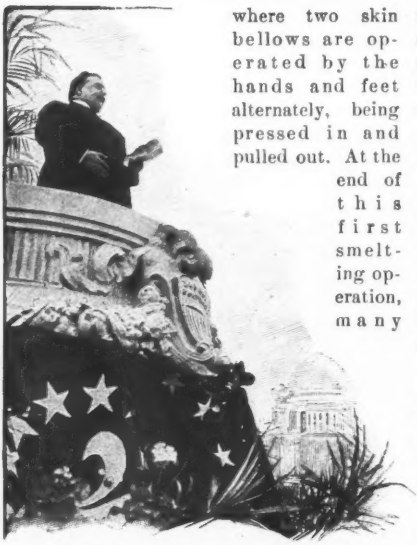
IX. THE MINING GULCH AND ITS WONDERS.

By John Brisben Walker.

"MINING GULCH" is one of the exhibits which ordinarily interest only a class; but even those not conversant with ores will find in the half-mile "gulch" some curious exhibits.

The visitor may start at the upper end and, beginning with the methods employed in old Mexico to smelt copper ores, obtain a very perfect idea of the exact processes used by Tubal-Cain. The whole smelting establishment represents a cost of not more than fifty dollars. But it carries the ore from the stone upon which it is crushed by the hammer of the poorly paid workman, on to a wooden trough where by agitation of the water it is separated from its clay components, leaving the metalliferous ores at the upper end of the trough. From this it goes into a small clay oven where it is roasted and oxidized, the sulphur being removed in the slow-burning process. Then it is carried to a blast-furnace which is probably as primitive as any that the world has ever known;

MEXICAN HAMMERING THE SMELTED COPPER INGOT INTO PLATES.



SECRETARY TAFT, REPRESENTING PRESIDENT ROOSEVELT, DELIVERING ADDRESS AT OPENING CEREMONIES.

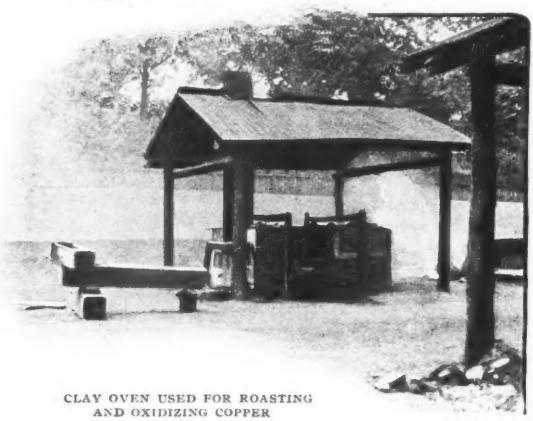
where two skin bellows are operated by the hands and feet alternately, being pressed in and pulled out. At the end of this first smelting operation, many tons of ore have been reduced to a high-grade "matte," which is crushed by hand and again roasted in a small two-dollar furnace. This time it is laid on charcoal on an open hearth, and through two tuyères made of clay at a cost of five cents or less, the blast is again blown by hands and feet until the degree of heat obtained is so high that the matte assumes a liquid condition. A green twig taken from a near-by tree must be used as the puddling-stick—the native sitting over the liquid metal and stirring until he obtains a substance which is practically pure copper. Nor is this all. The crude pig now goes under the iron hammer of another Mexican and is beaten out into the form of plates, kettles and the utensils of household economy in remote Mexico.

It is a noticeable fact that the natives have an ingenious method of producing the most brilliant hues of the rainbow in the copper. These colors are highly valued by the housekeeper in her collection of pots and pans. Some of the work bears crude designs wrought in with a blunted chisel.

The processes as used here are really very little different in theory from those in the great works of the Boston and Colorado Smelting Works at Denver. It is worthy of note how simply we may perform processes—though at an additional cost in

THE MEXICAN MINING-CAMP. THE COPPER-SMELTING FURNACE.

VISTA OF CASCADE HILL FROM THE EAST LAGOON, ON THE RIGHT THE PALACE OF EDUCATION AND SOCIAL ECONOMY; ON THE LEFT THE PALACE OF MINES AND METALLURGY AND THE PAVILION OF THE IMPERIAL GERMAN GOVERNMENT.



CLAY OVEN USED FOR ROASTING AND OXIDIZING COPPER ORE IN MEXICO.

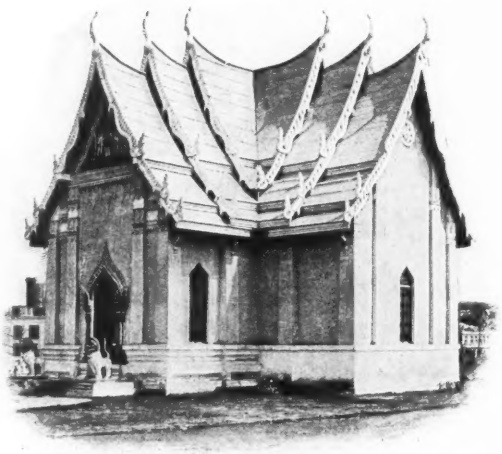
days of labor—which in our present-day work require millions for the erection of plant. Mr. Keller of the Mexican mining exhibit was my guide, and I scarcely could have been more fortunate.

In the compound containing this exhibit are a number of bamboo houses of the lightest and frailest character, not over eight by ten feet square and perhaps six feet high. But on the roof of each are tiles heavy enough to have come from one of the great Chinese temples. The Mexicans who operate these mines live a simple, easy life, working from but six to ten hours a day, living on a simple diet—principally beans and corn of their own raising; and there is no reason to think that, with their equable climate and simple wants, they should not be numbered amongst the most happy of the peoples who inhabit the earth.

And here I cannot refrain from diverging for a moment from these people living in contentment upon what we would call nothing, to the German Restaurant. There the table d'hote is three dollars. But that is not all. I made a test of the menu à la carte and discovered that it was possible to pay for a simple dinner consisting of nothing but soup, fish and cantaloup the large sum of two dollars and twenty-five cents, to say nothing of the fee to the waiter. I will venture to say that two-thirds of the people at this vulgar place were those who could not afford the expense of a three-dollar table d'hote dinner. Nine-tenths of them were strivers after social prestige and probably leading dissatisfied, unhappy lives, always in want for money and always doing vulgar things in their striving after effect. It is perhaps proper to notice here that while there are some very good restaurants at very reasonable prices on the grounds, this German Restaurant, for poor service in comparison with prices, and for its gross robbery, exceeds anything in my experience, which in restaurants has been somewhat extended.

I happened to mention this contrast to one of the managers of the Mexican mining exhibit, and he said that two dollars and twenty-five cents would have kept an entire family of six persons for a month at the mines of Carrizo.

It is claimed by some that once upon a time there was an art of tempering copper by which edges equal to those of the finest tool steel were obtained. That art has



PAVILION OF THE SIAMESE GOVERNMENT—A REPRODUCTION OF THE BEN CHAMA TEMPLE AT BANGKOK. QUAINT SIAMESE GARDENS SURROUND THE BUILDING.

disappeared through the ages, and notwithstanding the work of our ablest chemists, has not been rediscovered. But some day it may be found, although the multiplicity of metals and the admixtures that are being used make it no longer of consequence.

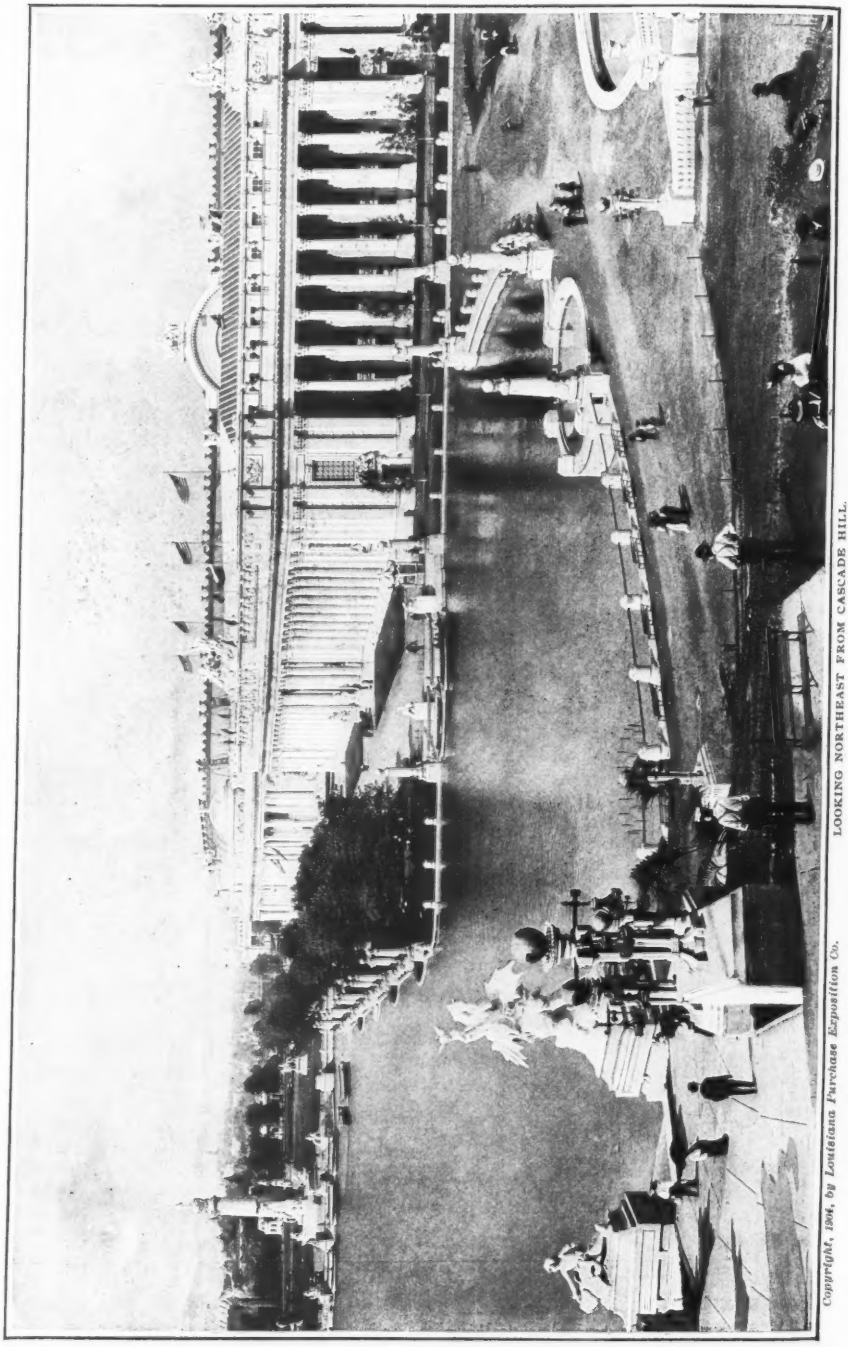
Just below the copper plant, a very good idea of a coal-mine may be obtained from an exhibition no less than seventeen hundred and fifty feet in length. One gets into cars very much like those intended to carry the actual coal. Along the route automatons are engaged in loading cars, sorting coal, swinging lanterns at switches, and performing all the other operations of coal-mining. There are air-shafts, buried miners, caves, a blacksmith's shop, cars coming out of drifts, and boys under age that ought never to be working in a coal-mine—the actual underground life. Two realistic representations were those of the harrowing escapes from a flooded anthracite mine, and of an explosion near Pittsburg where one hundred and ninety-seven men lost their lives.

This exhibition is instructive, well worth visiting, and calculated to give those who go through a very good idea of the perils and discomforts which a part of the poorly paid labor of the United States undergoes. It will give many people who live in luxury a greater sympathy for labor—besides being a scenic railway of a new and more useful kind.

A lead- and zinc-mine is shown underground at considerable extent, and gives a fairly accurate idea of the method used in this very large industry in Missouri. While people in all parts of the country are familiar with coal-mines and even gold-mines, the lead-mines of Missouri are less known than any other underground work, and they will be regarded with interest by the average visitor.

EMBARKING IN A GONDOLA FOR A TRIP THROUGH THE LAGOONS.

After being brought from the mine, lead ore is crushed and then taken in conveyers to the cylindrical sieves in which it is screened, passing thence to a series of tanks, the bottoms of which are grated. Through these narrow grates, plungers raise the water with sudden force. In the agitation of the material, the lead ore settles to the bottom of the first compartment, and the zinc and other materials pass off to the next. In the second compartment the zinc is caught, and the less valuable



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LOOKING NORTHEAST FROM CASCADE HILL.

materials pass on until finally ejected. Additional processes follow, to get the last remnant of ore from the refuse. The fine ores are again put through a process similar to the first, and when finally drawn off, they pass on to a reverberatory furnace in which they are smelted. Great lumps of ore were being unloaded from the car, which were said to run fifty per cent. in metallic zinc.

One of the interesting features in Mining Gulch was the intimate association which seemed to have sprung up between different exhibitors. Miners brought from all parts of the country and set down alongside one another suddenly developed friendships, and the utmost comity and courtesy were everywhere noticeable.

Amongst the wonderful economies which are to be found in every direction in Mining Gulch, was an apparatus for saving the waste heat of the hot slag as it comes from the furnace. Into an iron boiler the slag is dumped, and as it strikes the water the contact disintegrates the slag and sends it out in pulverized form, saving crushing, while at the same time the heat extracted from the slag converts the water into steam. What was formerly waste heat, in a fair-sized furnace will now give one hundred horse-power of steam.

The practical testing which is going on at the Exposition is not the least of its various features important to the country at large. There has been in the past in America so much guessing, so much inexact information; our people have had material so cheap that we have never been compelled to resort to those economies which Europe has learned to so much greater advantage than ourselves. Just at this time, when gas-engines and gas-producers are coming into use, the department of the Exposition which is undertaking to test the coals of the United States is worthy of careful consideration. A Congressional appropriation has been given to the Geological Survey for determining the most economic method of utilizing the various coals and lignites of the country. Sixty thousand dollars has been expended on this work in Mining Gulch. There are careful men in charge, and the best appliances are brought together from all parts of the world. Briquet machines are to be found there from England as well as the United

THE WASHINGTON STATE BUILDING. ONE OF THE BEST VIEWS OF THE EXPOSITION IS TO BE OBTAINED FROM THE TOP.

FIREPLACE AND MANTELPIECE IN THE EXHIBIT OF THE IMPERIAL ROYAL PROFESSIONAL ART SCHOOLS.

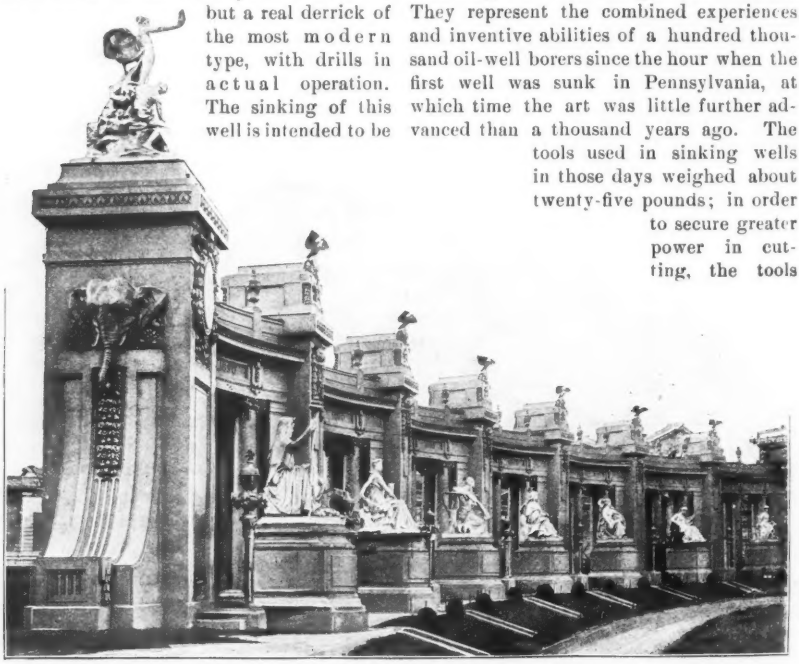
States. There are gas-producers working in competition, gas-engines and steam-engines with their power measured in each hour.

Not only is Mining Gulch rich in practical operations, but one may find there a representation of stalactite caves which resembles the Cave of the Winds in Colorado, and in some respects the Luray Caves in Virginia, and serves as a type for this class of natural underground openings. The particular cave from which this is reproduced is in the Black Hills in South Dakota, about eighteen miles from Deadwood. It has been explored for fifty miles.

A turquoise-mine is another of the underground exhibits, and the visitor interested in this class will find that a morning may be very pleasantly spent between the top and the bottom of the Gulch.

Elsewhere the practical side of the exhibition has been alluded to. The oil-well exhibit in the Gulch is not a representation of a scene in the Pennsylvania oil-fields, but a real derrick of the most modern type, with drills in actual operation. The sinking of this well is intended to be a record-breaking one. The records are to be kept for the benefit of St. Louis, under the direction of Dr. W. B. Potter. The rapidity with which the several operations used in boring are performed, and the perfection of the boring machinery itself, impress the visitor who has some knowledge of such things with wonder. They represent the combined experiences and inventive abilities of a hundred thousand oil-well borers since the hour when the first well was sunk in Pennsylvania, at which time the art was little further advanced than a thousand years ago. The tools used in sinking wells in those days weighed about twenty-five pounds; in order to secure greater power in cutting, the tools

"PHYSICAL LIBERTY," BY H. A. M'NEIL, ON THE MAIN CASCADE.



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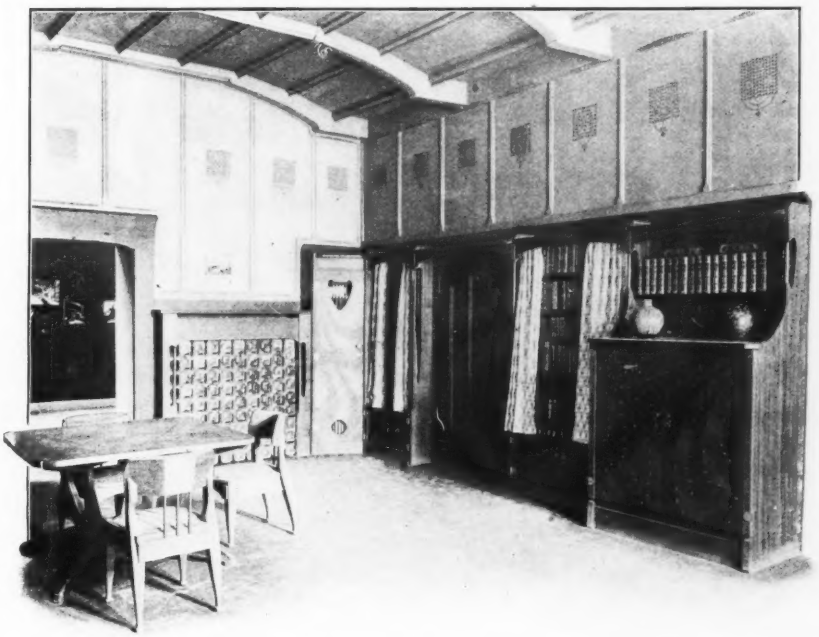
EAST WING OF THE TERRACE OF STATES. THE SCULPTURED FIGURES FROM LEFT TO RIGHT REPRESENT OKLAHOMA, WYOMING, SOUTH DAKOTA, COLORADO, KANSAS, IOWA AND MISSOURI.

now used weigh sixteen hundred pounds. There are not many tools in number employed in boring a well, but each one of these pieces of metal, in itself costing not more than a few dollars, represents a million dollars in thought and experimental work and ingenuity before it reached its present perfected shape.

The men on the ground in the mining-camps are a noticeable body. They are, of course, the picked men from their various branches, and represent the intelligence of the United States in one of its most perfected industries.



GERMAN ARCHITECTURAL AND HOUSEHOLD ART EXHIBIT—REPRODUCTION OF THE SUPERINTENDENT'S ROOM IN THE MANUAL-TRAINING SCHOOL AT NUREMBERG, DESIGNED BY RICHARD RIEMERSCHMID, OF MUNICH.

At the lower end of Mining Gulch is another industry in practical operation. Few people have ever had the opportunity of seeing how the beautiful forms of pottery are produced, and there is perhaps no operation which combines so many unusual and interesting varieties of manufacture. The first process is the securing of the clays. These are brought in cars from many parts of the world. Then, when the manufacturing chemist has determined his analysis, they are weighed out and carried in their right proportions to bins, where they are thoroughly mixed.

The next process is one of grinding; followed by sifting, to get rid of the grosser impurities. After this is done, the clays go into mixing-vats, where they are violently churned until the water has become a rich cream. Taking up a bit of this between one's fingers, it seems fine enough to be used in pottery; but it is not so yet. The mixture is pumped from the bins into presses, where, through fine-textured bags and under powerful screws, the water is squeezed out and a cake of hard clay is produced. This again goes back to the grinding-machine, this process of grinding being finer than before. The clay is now in condition for use. Under the deft hand of the potter

"This clay, this dream-sown sod, this chemic earth,
This wizard dust, wherein all shapes of birth—"

goes under machines of such power that it is pressed into an almost solid form. The

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A CORNER OF THE PALACE OF ELECTRICITY——

clay which has been treated till it seems to be entirely dry, has still sufficient moisture to give it shape under great pressure, or it is remixed into pliable dough and molded by hand. These tiles, and numberless vases, et cetera, are dried in ovens, then enameled and baked; and thus we have the ten thousand beautiful forms known to commerce.

At the lower end of Mining Gulch is also an exhibit of a subject of much importance to builders. Within the past ten years the use of cement in building operations has grown enormously. THE COSMOPOLITAN was one of the first to use cement for ornamentation and exterior. Those familiar with the photograph know what a beautiful building has been secured at a very reasonable cost. The engineers of the New York Central Railroad came to Irvington three times, and ended their investigations by recommending the construction of the new station in New York city in cement. The Grand Central Station so closely resembles stone that very few persons know that its origin is in cement. Great progress is being made in the manufacture of hollow blocks, which fit in and give rigid construction to walls at low cost, and are unequaled for rigidity and because of the air-spaces for interior ventilation. The cement work being constructed at the Exposition will enlarge the horizon of contractor and builder and demonstrate the extended possibilities of this form of construction.

The exhibit of the Colorado School of Mines is in the Mining Gulch, and furnishes a continuous lecture to young men on what an education in a school of mines means. Many young fellows, uncertain as to their futures, may find in this practical demonstration the information necessary to decide upon a career. In the Mining Gulch can be seen one of the best examples of carrying over long distances by wire-rope tramway. This machinery is shown in operation over a length of nearly a quarter of a mile.

——AND THE PALACE OF VARIED INDUSTRIES AT NIGHT.

X. MANUFACTURING PROCESSES AND MACHINERY AT THE FAIR.

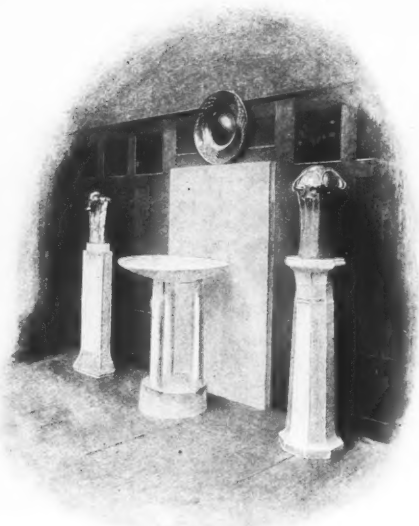
By John Brisben Walker.

THE twentieth century starts out with machinery being applied to every conceivable purpose. The amount of ingenuity exerted at the present time upon the invention of new machinery is beyond the power of calculation. But we may make some estimate by taking a single fact connected with the Exposition at St. Louis—namely, that in one portion of the German exhibit there are more than two thousand pieces of apparatus for performing processes mechanically. Some of these represent the work of a dozen inventors; some represent a dozen distinct inventions by the same inventor through a series of years. The effort everywhere is to relieve, through machinery, the hand and arm of their old-fashioned functions, to give them a power a hundred or a thousand times greater, as well as unerring accuracy in the duplication of operations.

To speak of Machinery Building at the World's Fair, therefore, seems like using a misnomer, because machinery enters into almost every building and every process. But those interested in the subject will find there such a variety of the larger machines as will be worthy of many hours of examination. Engines having a total of more than forty-five thousand horse-power are in operation.

The most striking exhibit in the Palace of Machinery is found in an engine that was either not exhibited at Chicago at all, or, if exhibited, was probably no more than in toy form of four or five horse-power.

This is the gas-producer and engine

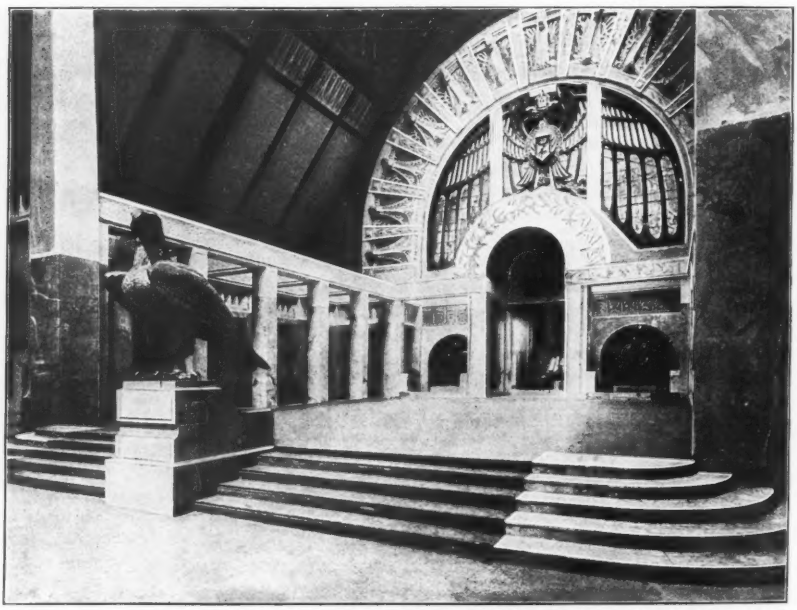


A FOUNTAIN EXHIBITED IN THE AUSTRIAN PAVILION.

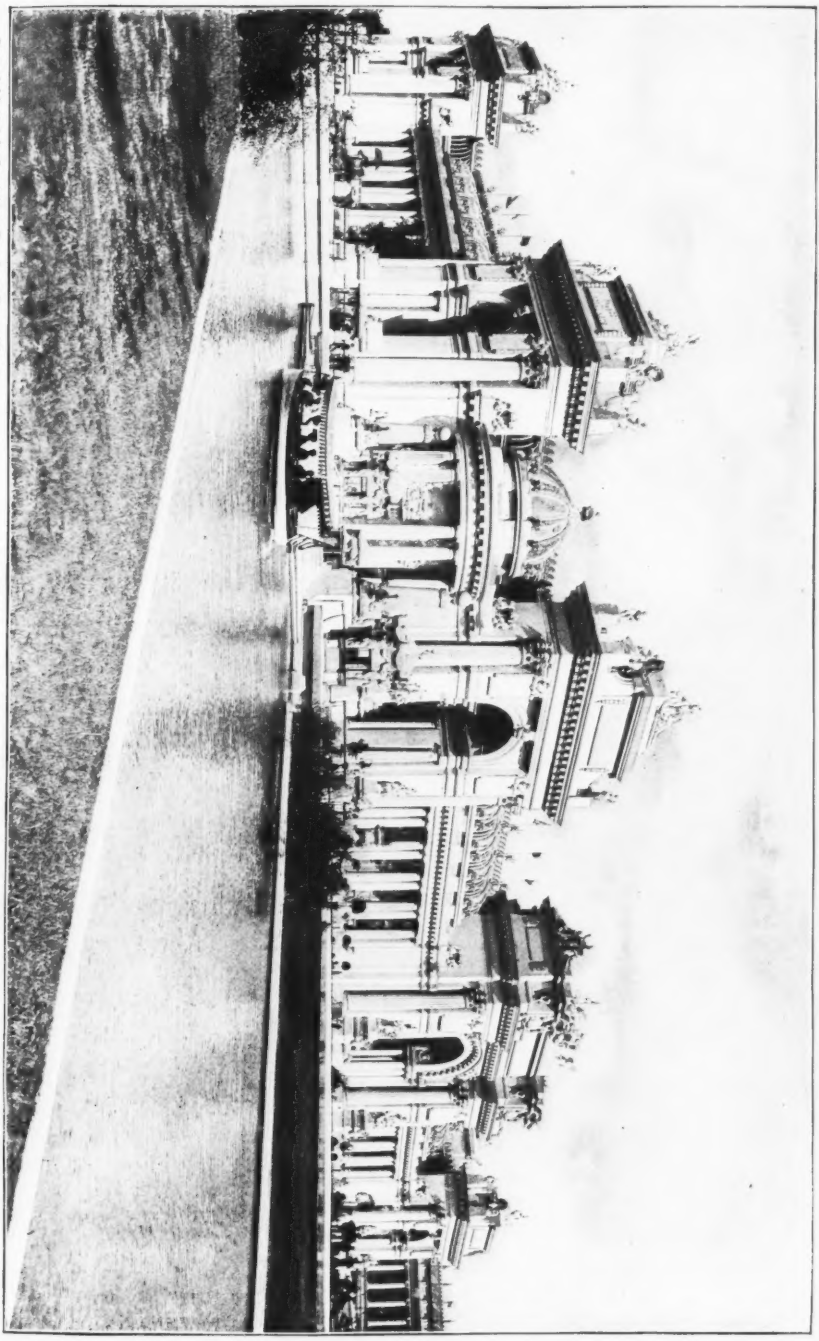
which, it is said on the best authority, is destined to work a complete revolution in the production of power for manufacturing.

By this invention, which has come to the front only in the last two or three years, a low form of gas is extracted from coal in a very simple kind of apparatus placed immediately adjoining the engine, and greatly minimizing the cost of the gas fuel.

What would probably have been the most important feature of the Exposition from an economical point of view has failed in a great measure through a rigidity of rule which should have been revised when new conditions made themselves apparent. These great gas-engines, which would have been worth much to the United States to have had on exhibition, and the contests resulting from such exhibits, would have been of immense value to American industry. Europe is so far ahead of us in the large gas-engine industry that we can scarcely be regarded as being in the field. It was, therefore, of the greatest importance that this particular exhibit should have been of the most superior character, and it is much to be regretted that the arrangements which the management of the Machinery Department had made should have fallen to the ground through a stupid construction of rules by insurance authorities who failed to comprehend the character of the exhibit.



GRAND ENTRANCE TO THE GERMAN EXHIBIT, A MAGNIFICENT COLOR-SCHEME IN MARBLE AND BRONZE.



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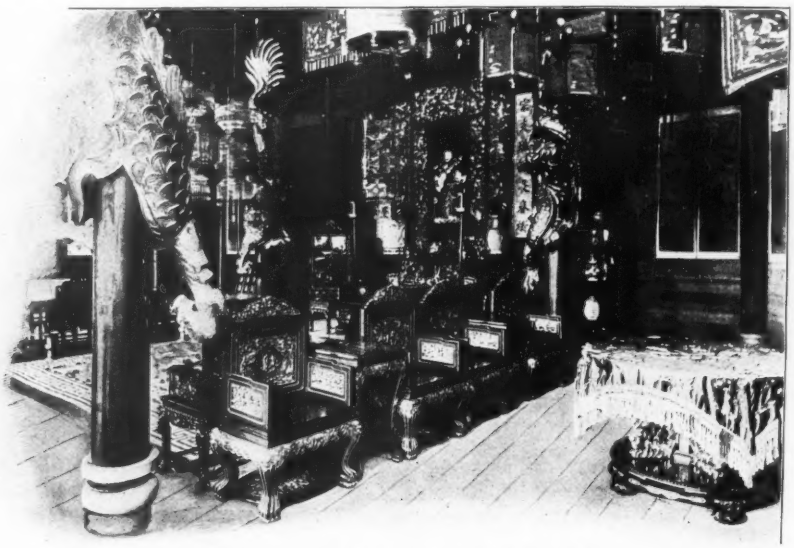
THE PALACE OF LIBERAL ARTS

The contract with the firm of A. Borsig, of Tagel, near Berlin, Germany, was one which would have intensely interested every American manufacturer. The guarantee given by Borsig was that he would produce for the use of the Exposition 1,750 horse-power with an expenditure of 1,550 pounds of anthracite coal per hour. This is so revolutionary that if I did not have it on the statement of one of the chief officials of the Exposition, I should be unable to credit it. Extremely good practice in America calls for an expenditure of more than three pounds of coal per horse-power. This for 1,750 horse-power would be 5,250 pounds of anthracite coal per hour, against 1,575 pounds by European practice—a startling statement.

Lieutenant Carden visited France, Germany and Belgium with especial reference to gas-engines. He found at the Cockerill works in Seraing, Belgium, that they were utilizing a number of high-power gas-engines in the regular course of their work. The gas was secured from the heat-units ordinarily lost from the blast-furnaces. No reservoirs were employed, but on the contrary the gas passed direct from the blast-furnaces through washers, and thence to the engines. The statement was made by the directors at the Seraing works that within eighteen months they would not have a steam-engine in service. At the Deutz works, at Cologne, he was shown the plans for a new gas-engine which will be ready for service by 1905. The rating of this new gas-engine was 6,000 horse-power.

Another form of power which comes to the front in the 1904 Exposition is likewise of a character that was not shown at Chicago, or if on exhibition, as was the case with the gas-engine, was in toy form.



CHINESE EXHIBIT. REPRODUCTION OF RECEPTION-ROOM IN PRINCE PU LUN'S PALACE.

Steam-turbines are to be found in this exhibit, running from 600 to 3,000 horse-power. These occupy spaces even less than the old-fashioned 40-horse-power horizontal engine. They are compact, steady, with practically no vibration, and are apparently simplicity itself.

There is much doubt felt in the scientific world as to just what the turbine-engine will accomplish, but the fact that great steamship lines are adopting it, and that it is going into some of the largest power-plants in the world, would seem to indicate that our best engineering talent has no doubt at all as to both its efficiency and its economy.

While no turbine-engines larger than 3,000 horse-power are on exhibit at the Fair, others of 8,000 horse-power are in process of construction.

So great is the ingenuity of modern workmen, that no sooner is a great invention completed than it is liable to be displaced by still another and a more ingenious piece of machinery. After hearing the facts, given by Lieutenant Carden, regarding the superseding of steam by the gas-engine in Europe, it produced a feeling of melancholy to walk among the magnificent examples of steam-enginery which are shown in the Machinery Building, reflecting that they had been brought to this splendid development only to have their places taken by another form of power.

One of the best examples illustrating the way in which machinery is coming to

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CIRCULAR COLONNADE AT ANGLE OF PALACE OF VARIED INDUSTRIES. 38

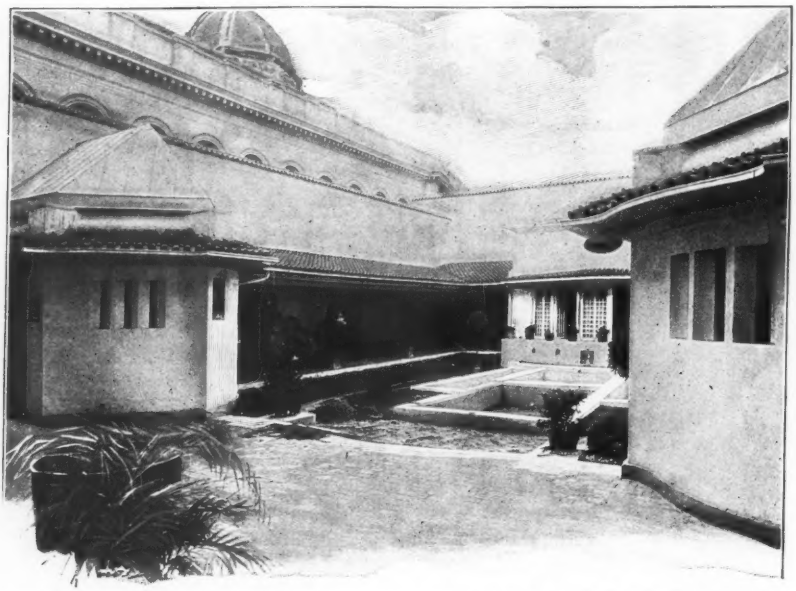
do all kinds of work, is that of a new form of link-belt which has largely been invented since the Chicago Exposition.

In every large manufacturing operation there is much conveying of finished or partially finished goods from one part of the factory to the other. In the early days, individuals conveyed these packages by hand. Then came the two-wheeled truck, to be followed in time by the four-wheeled truck. But it all meant an endless number of employees moving backward and forward, and the extra space required for such movement. The invention of the link-belt—metal links so contrived that they could move up-hill and down, from one story of a building to another—marked the next advance. A little later, this was improved upon by the invention of a link which could not only climb up and down, but could turn curves, going from one building into another at right angles, and so contrived as to pursue a devious course to any part of the plant. The exhibit made of this machinery at the World's Fair is a marvel in its simplicity and ingenuity. It is intended for a bottling establishment, and upon the belt are placed boxes of glass. When it is necessary for these to climb from one story to the next above, a push-piece rises behind each box and carries it on rollers safely up the incline. If the grade is a descending one, it is calculated to give just the right motion.

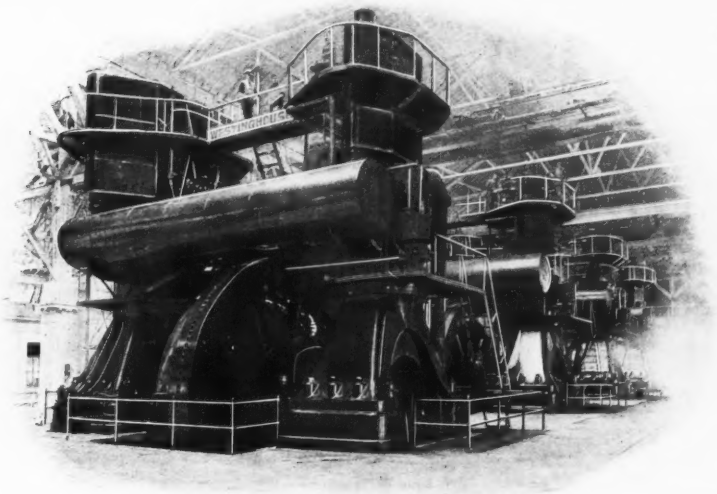
Not even a box is any longer nailed by hand in the great factories, but is fastened by machinery under a nailing apparatus. One side is edged up automatically under the nailing machines, and down come half a dozen tubes, each carrying a nail over the point which it is desired to fasten. Then inside the tube a plunger descends, pushing the nail straight into the box. Instantly the box is seized by the machine and automatically turned around, and the same performance is repeated on the opposite side.

Every kind of power has been brought into use for the various purposes of industry. Since the Exposition at Chicago, electric power has been developed into small motors which can be applied to individual machines in whatever part of a factory they may be located, the power being used only when the machines are in operation.

Scarcely any problems of the kind having special requirements remain unsolved. There is a fireless engine for use in those mines where dangerous gases will not



A BEAUTIFUL OPEN COURT—GERMAN ARCHITECTURAL EXHIBIT IN THE PALACE OF VARIED INDUSTRIES.

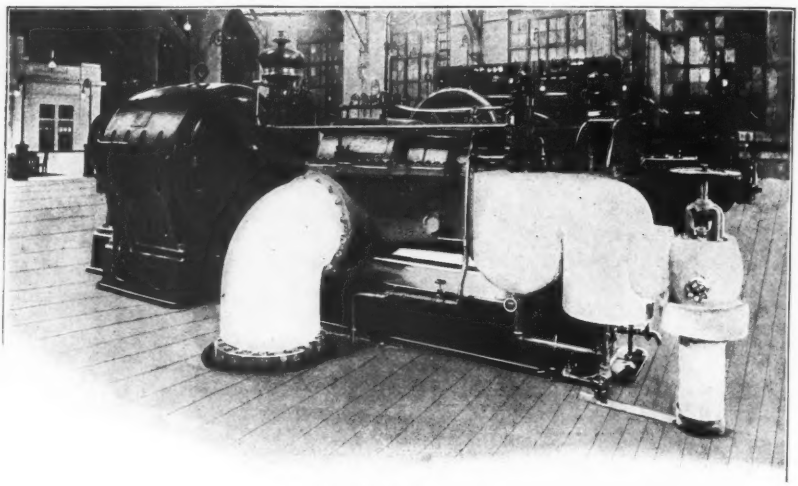


THE 14,000 H.-P. PLANT SUPPLYING CURRENT FOR PUMPING WATER TO THE CASCADES, A PART OF THE DECORATIVE LIGHTING OF THE MAIN BUILDINGS AND THE ENTIRE COMMERCIAL LIGHTING OF THE BUILDING, GROUNDS AND PIKE. FOUR WESTINGHOUSE-CORLISS RECIPROCATING CROSS-COMPOUND ENGINES DIRECT-CONNECTED TO 2,000 KILOWATT GENERATORS.

permit the introduction of the coal-fire locomotive, and make dangerous even the risk of the presence of an electric spark. This type of "engine" consists of a boiler, partially filled with water, which is charged with steam under two hundred and fifty pounds pressure, from a stationary plant located outside the mine. By means of a reducing-valve, the steam is passed into the engines at about one hundred pounds to the square inch, the reduction of pressure also converting the water in the reservoir into steam. The length of journey which these engines can make is surprising, and their safety in mine operations is absolute.

The forms which iron-making takes at the Exposition would surprise Vulcan if he could return to earth. One of the most extraordinary shapes is that of a four-foot wrought-iron pipe, three-eighths of an inch in thickness and corrugated. Even those quite familiar with iron-making stop and wonder by what processes this has been evolved. It is probable that it owes its making to the perfecting of the several methods of welding, electrical and chemical, which have been worked out largely since the Chicago Fair. These permit the manufacturer to bring metals together in such homogeneity that the welding-point is almost invisible, and as a consequence there are shown in the Machinery Building nine-foot tubes which exhibit no row of rivets nor any visible seam.

One reads of the work performed by the modern explosive shell, but has little idea of the ingenious processes which have been invented to bring the armor-piercing projectile to its present state of efficiency. At one of the exhibits there is shown the seamless drawn-steel tube cut into proper lengths which serve as the first operation for shell-making. This has been drawn from a metal disk, and the lower end of it remains closed. The opposite end is placed under a press and swedged in until the point is formed. Then it is put on a lathe and turned accurately. A groove is cut near the base into which is inserted the copper ring that is to melt into the rifle grooves upon the discharge of the gun and give the shell its circular motion. Most curious of all is the piercing end. This is not pointed, as one would imagine, but contains a cylindrical cap intended to lubricate the shell as it enters the armor. The lubricant, however, is not tallow, but



THE NEW STEAM-TURBINE.

soft iron, which, under the great heat generated by impact, melts and first prevents the shell from glancing, and then holds it to its work of piercing the heavy armor.

In the same exhibit is an example of the endless improvements required to bring any of the great modern inventions into perfect working. In the first advances made in the art of building mechanically driven street-cars, the pinions were of cast iron. An improvement on this was cast steel. Then, something better being required, pinions were cut out of "drawn" steel. But the tremendous wear and tear on the street-car pinions demonstrated the necessity of a still higher art, and this was finally found by taking a piece of drawn steel and putting it in a hydraulic press under the almost inconceivable pressure required to form into shape the cogs required on a pinion-wheel. The figures that I dictated at the time, as given by the attendant in charge, are one million pounds pressure to the square inch, but I am afraid to give them here, so terrific is the force meant by such a pressure. As a consequence, a pinion was produced in which the "flow" of the iron follows the outlines of the cog, and gives a superior wearing surface.

We turn from forming heavy metals under these great pressures to machines which convert the most delicate metal sheets into a thousand forms, from the deep shell of a mandolin body, with handle and key-holder, all made out of a single plate of metal, on up to a steel barrel three feet high pressed from two sheets of metal, each sheet forming half a barrel, and then again on down to a delicate watch-case.

So ingenious are the presses which are manufactured for this purpose, that from a slit of steel is punched on one machine a bucket head, which by three operations not only receives several rings to give it rigidity, but has the tin carried down in the form of a flange to fit the interior of the bucket, and also projected upward to cover the flange.

The average man or woman sitting at the breakfast-table notes the tin head that fits the catsup bottle. It does not seem very wonderful, but it has involved in its manufacture ingenuity of the highest order. Originally there was made a press which punched a disk into a cup shape, the remainder of the operation being performed by hand. Later, a mechanic conceived the idea, seemingly impossible, of accomplishing two operations with the same machine. Still later, a machine was invented to take automatically the cup of tin and by an ingenious operation throw it out a second later with a screw end completely formed.

Within the last ten years the development in the working of sheet metal has

been very great. There is little or nothing to-day which cannot be made out of sheet steel, and the economy of operation is such that it is bringing all sorts of inventions for the household and for the handling of food within reach of the manufacturer at a cost that taxes the public very little.

One of the applications of machinery is a new device which purifies water by a non-chemical method. By a process of atomizing, the water is broken up in such minute particles that any impurities are separated, and invariably caught in the filter-beds.

In connection with machinery, there is an interesting exhibit at the Fair of a great piano factory, with each of its six stories, and all of its operations complete. It is on an exact scale of one-half inch to the foot, and shows every operation from the time the raw product reaches the factory until a piano is turned out ready for the market. Tiny electric lamps light up the interior, and show the workmen engaged in their several occupations.

For the woman who ventures into the Machinery Building, there are not a few things which will appeal to her directly. One of these is the exhibit of apparatus connected with the manufacturing of cakes, candies, chocolate, bread, et cetera.

One would scarcely think that it requires four classifications to describe this machinery; yet it does. The first is a draw-blade oven, in double-deck form, in which the fire is supplied by coke at the back, having no connection whatever with the oven itself, so that gases cannot injure the product. With the most absolute accuracy the plates upon which the baking is done are drawn in and out. Wheels close the apertures, and it is impossible to imagine anything better adapted for its purpose.

The second is a plant for manufacturing caramels. Steam-jacketed copper boilers here revolve automatically. When heated to the proper degree, a wheel throws the beater up out of the liquid, and the movement of a lever tips the kettle to the desired angle. The plate on which this caramel is deposited is cooled by the circulating water underneath. Then comes a corrugated roller, which no sooner passes the material to one end than it reverses and brings it back. Then, on a broad and beautiful mahogany slab, the caramel is drawn through under a cylinder on which there are perhaps forty sharp steel disks for cutting it into the required sections.

Sugar-boiling machinery is the third classification. No longer is it the proper thing to boil in an ordinary kettle, but in closely jointed cylinders, where a vacuum is used, with pots ingeniously placed on a pivot so they can be lowered and the contents poured on a circular cooling-stand. When the sugar is taken from the cooling-plate, it passes between rolls which are figured to give it the desired shapes. Then it follows along a cooling-table through which drafts of air are driven. When it arrives at the far end, a shaking-sieve removes all dust from the candy, and

VESTIBULE AND TRANSVERSE AISLE OF THE GERMAN NATIONAL PAVILION.

the finished product passes into a box.

Fourth come the various machines for a chocolate plant, but this appertains more particularly to candy factories, and would not be generally interesting.

There is still another kind of machine for the making of sweetmeats shown in another part of the Fair. Since sugar has been known, the art of making it into confections has been well understood. As its various shapes depend upon the varying degrees of heat, these results were certain to be found out through the earliest experiments. But the new machine is an attempt in a different direction. It consists of a sort of centrifugal churn, moving at the rate of two thousand revolutions per minute, inside of a large porcelain-lined pan, with an opening in the top which permits the pouring in of dry granulated sugar. That is all. Electric heat and rapid motion do the rest. Quickly melted, the sugar is thrown out through the minute pores in the form of threads finer than the hair of the head. This fine sugar thread, which is of more than silk-like delicacy in texture, rapidly accumulates around the bowl and is removed in large fleeces which have the appearance of the finest silk, and are delicious to the taste.

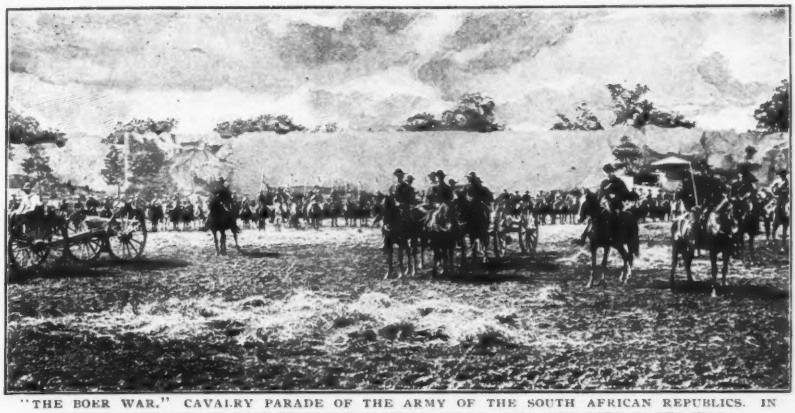
GERMAN ARCHITECTURAL EXHIBIT.
A BUSINESS OFFICE DESIGNED BY BRUNO PAUL, OF MUNICH.

Another form of machinery, interesting because novel, is shown in the enclosure devoted to aerial navigation experiments. It consists of a fire-brick regenerative gas-furnace containing twenty retorts divided into two sections. In these retorts iron turnings are placed. Then, after being heated to about 1,200° Fahrenheit, superheated steam is turned into one section, and impinging on the red-hot iron turnings, is decomposed, the iron filings are oxidized, and the hydrogen is freed and passes off through pipes into washers.

This process is reversed in the second furnace and carbureted water-gas is sent through the first section of retorts in a direction opposite to that taken by the steam. This removes the oxygen from the iron and restores the latter to its natural condition.

The washer for the hydrogen gas is in the form of a cylinder eight feet in diameter and about five feet high. It is filled with coke resting on a grating, and over this sprinklers rotate, sending down showers of cold water. A six-inch pipe carries the hydrogen gas from the plant to the balloon-shed where it is used.

The attempt in this brief article has been to give an idea of the application of invention to all classes of production, rather than to try to describe those splendid collections of tools, of engines, et cetera, which are so generally understood as to present few novelties to the average reader.



"THE BOER WAR." CAVALRY PARADE OF THE ARMY OF THE SOUTH AFRICAN REPUBLICS. IN THE FOREGROUND IS SOME OF THE TRANSVAAL STATE ARTILLERY USED IN THE WAR.

XI. THE BOER WAR

AS RENDERED BY BRITISH AND BOER WARRIORS AT THE EXPOSITION.

By John Brisben Walker.

GEN. PIET A. CRONJE, LATE OF THE ARMY OF THE SOUTH AFRICAN REPUBLICS, WHO TAKES PART IN THE REPRESENTATION OF THE BOER WAR.

A GREAT crowd was climbing up one of the seven hills that half encircle the two square miles of the Louisiana Purchase Exposition. As I followed them through a great entranceway, there rang out on the right the quick spat-spat-spat of a rapid-fire machine-gun. Then, irregularly, the ping of infantry rifles, and as we climbed into our seats within the great amphitheater, British artillery was galloping to the front, swinging into position, then "Limbers to the rear," and flash followed flash in quick succession. On the heights across the Modder River the enemy were replying with rifles. Shells from the guns seemed to drop and burst among them. Men fell from their horses, artillerymen dropped at their guns, horses fell to the earth and rolled over, seemingly in mortal agony. The advance-line along the river-bank was all mowed down one after the other, men and horses dropping in rapid succession until the fire of the British was weak and uncertain. Then, with a cheer, the Boer cavalry swept out from behind the rocks and down into the river and across the plain, and in a minute more Cronje—not an imitation, but the Boer general himself—was standing on an ammunition-chest waving the Boer colors amidst the shouts of the victorious South African patriots.

There had been rain the day before and the field of battle was still wet. Guns and wagons were covered with mud as if they had just come from the Army of the Potomac—and they were six-pounder "Parrots," by the way, of that era; uniforms were splashed and boots were half an inch thick with mud. The horses were of no sluggish breed, but splendid animals, stretching their necks with the excitement of the charge and trained to fall to the ground and roll over at the command of their riders; then the ambulances came into the field and the wounded were removed and the spoils of victory gathered together, until suddenly a canvas curtain swept along the front of the amphitheater and shut off the view.

It was real war; much more like the real thing than the majority of the war correspondents will see along the Liao Tung peninsula; as realistic as the greatest war enthusiast might desire, with the knowledge that the scene was being enacted by the real heroes of the battles which were now being represented in mimic warfare.

A BOER HOWITZER BATTERY.

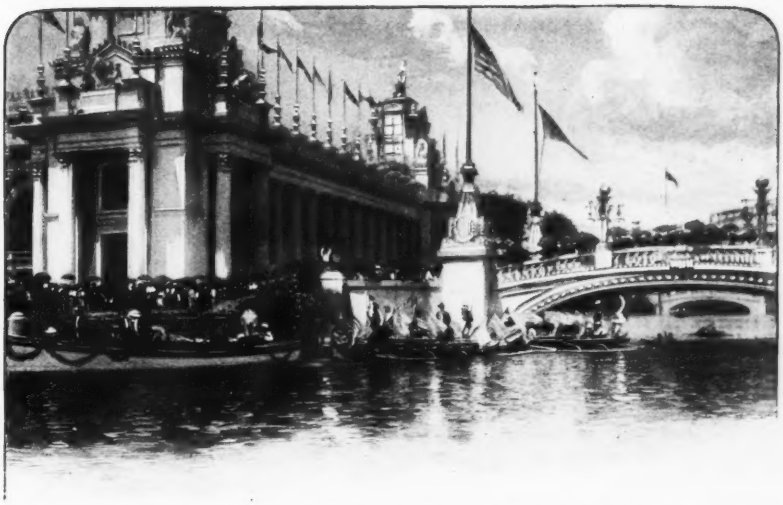
And such splendid horsemen! How they sat their saddles, Cronje with his one arm, and Viljoen the handsome beau of a cavalry leader!

I was taken after a while by the manager behind the scenes to hunt up these chieftains, and as he came around the last row of seats calling, "Cronje! Viljoen!" a voice cried out, "Get in here quick. Here they come," and my guide and I had no more than time to jump into the seat enclosure, when with a rush, two high vehicles, each swaying in the air on its two wheels and drawn by four leaping broncos, came by like a whirlwind. "The editor of THE COSMOPOLITAN—General Cronje and General Viljoen"; but neither paid the slightest attention. They were watching the flight of the two vehicles with as much interest as if it had been a division of cavalry thundering down in a final charge which was to crown the day with victory. "He has won! No—yes—aha! I told you so!" and then the two heroes are once more alive to the world about them. They give my hand a strong, hearty grip, and for five minutes we talk of the Boer war and its outcome.

The next day when I took up the morning paper, I found that as I had looked on at this mimic warfare and talked of South Africa with Cronje and Viljoen, President Krüger, the patriot and statesman, was breathing his last in Switzerland. Strange fates do mortals meet with; the unexpected eternally happening, and in it so often mixed the sarcasm of a thousand devils upon the aspirations of our past.

"Passionate particles of dust and sun,
Run your brief race, nor ask why it is run—
We are but shadow-pictures, voices, dreams;
Perchance they make and break us just for fun."

"THE BOER WAR." THE CAPTURE OF COLONEL LONG'S GUNS AT THE BATTLE OF COLENSO. A RED CROSS AMBULANCE IS REMOVING THE WOUNDED.



THE PALACE OF ELECTRICITY DECORATED FOR A SPECIAL FÊTE-DAY.

XII. ELECTRICITY UP TO 1904.

By John Brisben Walker.

'——an atom of matter composed wholly of electricity:—which thus steps on the stage as the fundamental and really atomic substance.''—*Sir Oliver Lodge, F. R. S.*

THE World's Fair of 1904 may be regarded as marking the beginning of an era of knowledge regarding electricity. At the Chicago World's Exposition the scientific world might be said to have been in complete darkness.

Radium seems to have furnished the thread which will lead to accurate knowledge. Although but a short time has elapsed since Mme. Curie succeeded in extracting this metal, the results already have been wonderful. A hundred thousand brains have been at work on the problems presented, and out of the formless void has come a new theory of matter which seems reasonable. If this new hypothesis should prove correct, we may proceed rapidly to an understanding of our universe.

Because we have had a false conception of matter, the world has been obliged to grope its way forward. Not improbably, if Sir Oliver Lodge is right, the next five years may see ten times as much real progress in electrical work as all preceding time.

Upon this department of the World's Fair, therefore, we must look, not with pride of accomplishment, but as indicative of the darkness through which science has been feeling its way.

In one of the most important scientific contributions of any time, Sir Oliver Lodge, F. R. S., writing in ''Harper's'' for August, lays down these theories. They are of so great interest that the extract given is made purposely full:

MATTER IS COMPOSED OF ELECTRICITY AND NOTHING ELSE.

''Electricity is not a form of energy, any more than water is a form of energy. Water may be a vehicle of energy when at a high level or in motion: so may electricity. Electricity cannot be manufactured, as heat can, it can only be moved from place to place, like water; and its energy must be in the form of motion or of strain. Electricity under strain constitutes 'charge'; electricity in locomotion constitutes a current and magnetism; electricity in vibration constitutes light. . . .

''Now we can go one step further and

ENTRANCE TO OPEN COURT OF THE CHINESE PAVILION.

say: Matter is composed of electricity, and of nothing else,—a thesis which I wish to explain and partially justify.

"First we must ask what is positive electricity? and the answer is still we do not know. For myself I do not even guess, —beyond supposing it to be a mode of manifestation, or a differentiated portion, of the continuous and all-pervading Ether. . . .

"But concerning negative electricity we know a great deal more. This exists in excessively minute particles, sometimes called electrons. . . .

"Each electron has a definite charge of electricity, viz., the same charge as is conveyed by each single atom when a current is passed through a chemically conducting liquid. Every electron has also a definite and uniform mass, which is about 1-800th of that of an atom of hydrogen—hitherto the lightest known form of matter.

"From every kind of material the same and no other kind of electron can be obtained, and we have reason for asserting that no other kind exists. . . .

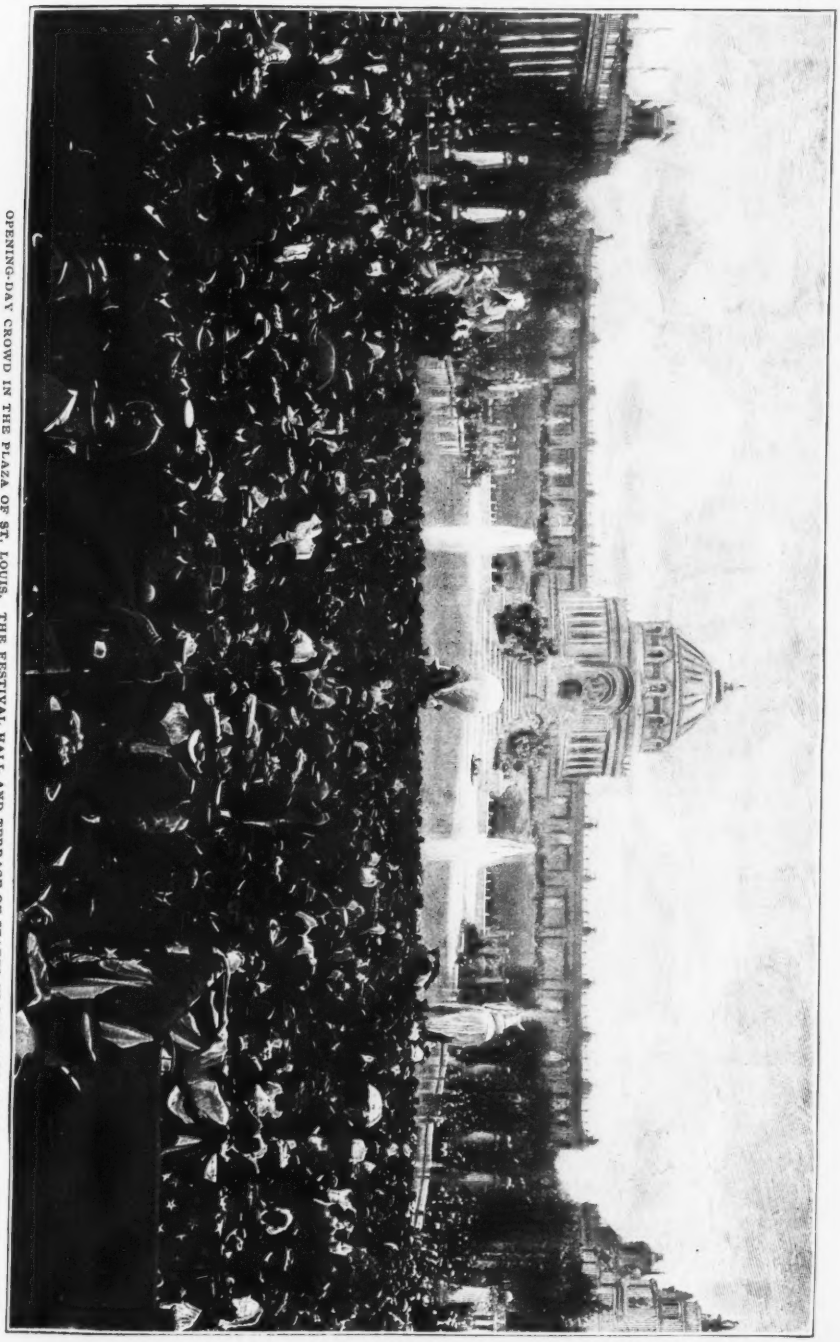
"Inside a hydrogen atom electrons are therefore very sparsely distributed, for there is manifestly plenty of room for 800; more room indeed than there is in the solar system for the sun and planets; but some atoms contain many more than this number, and the tightest packing known exists in the atoms of the radio-active substances, Uranium, Radium, and the like, each atom of which contains something like two hundred thousand electrons. . . .

"Our present view of an atom of matter therefore is something like the following: —Picture to one's self an individualized mass of positive electricity, diffused uniformly over a space as big as an atom, . . . or such that a million million million million could be crowded tightly together into an apothecary's grain. Then imagine, disseminated throughout this small spherical region, a number of minute specks of negative electricity, all exactly alike, and all flying about vigorously, each of them repelling every other, but all attracted and kept in their orbits by the mass of positive electricity in which they are embedded and flying about. . . .

"The electrons are extremely energetic and forcible, though in bulk mere specks or centers of force. Every speck is exactly like every other, and each is of the size and weight appropriate to the electron. *Different atoms, that is atoms of different kinds of matter, are all believed to be composed in the same sort of way;* but if the atoms of a substance are such that each possesses 23 times as many electrons as hydrogen has, we call it sodium. If each atom has 200 times as many as hydrogen, we call it lead or quicksilver. If it has still more than that, it begins to be conspicuously radio-active. . . .

"Matter then appears to be composed of positive and negative electricity and nothing else.

THE ESKIMO WOMAN IS NOT SLOW TO REALIZE THE BLESSINGS OF CIVILIZATION



OPENING-DAY CROWD IN THE PLAZA OF ST. LOUIS. THE FESTIVAL HALL AND TERRACE OF STATES IN THE DISTANCE.

All its newly discovered, as well as all its long-known, properties can thus be explained:—even the long-standing puzzle of 'cohesion' shows signs of giving way. The only outstanding still-intractable physical property is 'gravitation,' and no satisfactory theory of the nature of gravitation has been so far forthcoming. I doubt however if it is far away. It would seem to be a slight but quite uniform secondary or residual effect due to the immersion of a negative electron in a positive atmosphere. It is a mutual force between one atomic system and another, which is proportional to the number of electrons in each."*

I quote these extracts here at such length because I believe they mark the beginning—the entry—of the World of Science upon that true theory of matter which, when fully grasped, will lead almost at once to the most wonderful discoveries which have yet marked the progress of man.

INDIAN FOUNTAIN GROUP, "THE DESTINY OF THE RED MAN," BY A. A. WEINMANN, IN THE MAIN AVENUE.

THE WIRELESS TELEGRAPH.

If all matter is electricity, as so many now believe, the hopes to be entertained of discovery and progress in electrical science are almost without limit. Who would have been so bold at the Chicago Fair as to predict wireless telegraphy? Yet here we are, eleven years after, in the midst of its adaptation, with half a dozen systems already in process of utilization.

First, Marconi, to whom the world owes the chief debt of gratitude, because, however many theories have preceded him, his was the work which brought wireless telegraphy to a basis of commercial use—his the courage and patience which forced its advantages upon an unwilling commercial world.

Then De Forest, whose system is represented by tall masts and towers at the Exposition, carrying on communication with the surrounding world.

In England, the Lodge-Muirhead.

In Germany, the Slaby-Arco, and the Braun methods, now known as the Siemens-Halske system.

In France, the Ducretel.

In Russia, the Popoff.

No fewer than five different systems are in use by the United States, which is not very far-sighted so far as governmental efficiency goes, but excellent in that it gives an opportunity of testing the several merits of the various methods employed.

Great Britain is spending a hundred thousand dollars a year equipping its battle-ships and forts with the wireless telegraph. The United States has contracted to connect its mainland by wireless telegraphy with Key West, Cuba, Porto Rico and the Republic of Panama.

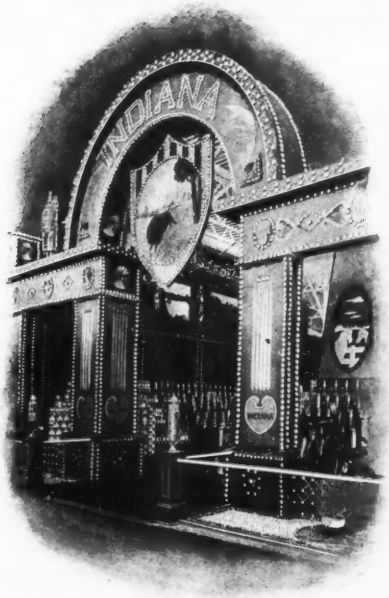
The Bay of Pechili is fairly bristling with wireless telegraph stations. Port Arthur was long ago arranged to connect with the outer world in the event of being cut off by the besiegers. The London "Times" has erected on the Shangtung promontory, near Weihaiwei, a great mast to which is sent from another mast on board its correspondence despatch-boat, "Haimun," the latest news by wireless telegraphy. Already this service has furnished its romantic incidents. The other

*In reply to a note sent to Col. Samuel E. Tillman, Professor of Chemistry at the United States Military Academy, West Point, the following was received:

"July 31, 1904.

"MY DEAR WALKER: Yours of 28th just received. You are perfectly safe in using anything that Lodge writes—always, of course, with the restrictions that he himself places upon his 'gropings after a physical conception,' not theories yet, but justifiable hypotheses. Very sincerely yours,

"S. E. TILLMAN."



ORNAMENTAL ENTRANCE TO ONE OF THE STATE EXHIBITS.

day, after the Russians had issued an edict declaring that they would treat as spies all correspondents found communicating by wireless telegraph, the "Haimun" was caught by the Russian war-ship "Bayan." The "Times" man immediately notified Weihaiwei:

"Being boarded by the Russians. If do not hear from us in three hours, notify British war-ships and London 'Times.'"

Just as the Russian officers came over the side of the "Haimun," an answer came:

"Have notified British fleet. From window of operating-room can see activity on board battle-ships; getting up steam." The operator further telegraphed, in modern vernacular: "And this is no dream."

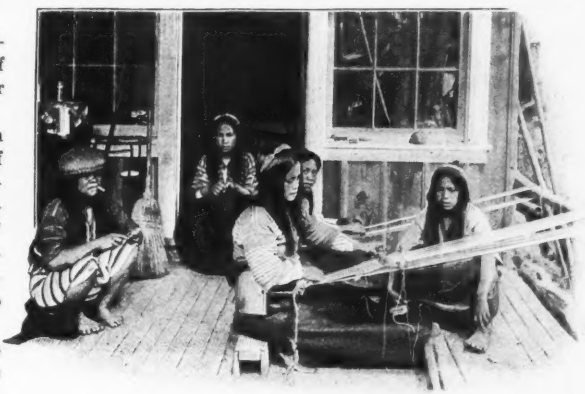
The Russian officers found the copies of the last message sent and noted the reply; then hurriedly left the ship without hanging any correspondents to the yardarm.

The next most important development since Chicago is

THE STORAGE BATTERY.

After the first practical application of the storage battery, much was hoped for its usefulness. It must be said, however, that the work of the past five years has been largely disappointing in character. Perhaps it is because so much was expected that the moderate advances made have seemed unsatisfactory. Mr. Edison has claimed that he has made great improvements in the construction of storage batteries for automobiles. For some reason, his invention does not seem to have come into general commercial use, the batteries of other makes still maintaining their supremacy. It is difficult to understand the merits of the controversy which has gone on with reference to this matter.

Within the Exposition grounds, and to and from the city, a large number of electric carriages are being operated. These seat from eighteen to forty persons, and seem to be commercially available, though of such large size. Their great weight renders them necessarily slow of movement and dangerous in crowded streets, besides giving a very uncomfortable jar to passengers. They furnish, however, one of the pleasantest ways in which the architectural effects of the Exposition may be taken in, and a general idea of the grounds and buildings obtained in a brief space of time.



PHILIPPINE EXHIBIT—NATIVE MODE OF WEAVING.

GERMAN ARCHITECTURAL AND HOUSEHOLD ART EXHIBIT—CORNER OF A STUDY DESIGNED BY PROFESSOR GRENANDER, OF BERLIN.

Storage batteries are being used to take up the surplus power of city stations during the lax time of the trolley day. They are also coming into use for country-house lighting, and similar purposes wherever small water-powers or windmills can be utilized to store up energy.

The most extraordinary advance in the use of electricity since the Chicago Fair is

LONG-DISTANCE HIGH-TENSION TRANSMISSION.

High-tension lines in California are operated over a distance of more than three hundred miles. Electricity is carried over the wires under a pressure of from thirty thousand to eighty thousand volts, and experts in this work say that the end is not yet. As a consequence of the improvements which permit this transfer of electricity over such long distances, water-power everywhere in the United States is rapidly being utilized. Niagara, which at the time of the Pan-American Exposition four years ago was producing one hundred and fifty thousand horse-power, will shortly be conveying to the wires five hundred and fifty thousand horse-power.

Keeping pace with this development is

THE ELECTRIC LOCOMOTIVE.

This has grown in power just as the advantages of electric rail transportation have come to be understood. The New York Central Railroad is one of many upon which electric power is being substituted for steam. Four tracks with one-hundred-and-ten-pound rails are now being laid out of New York city for thirty-six miles up the Hudson. Upon these, small electric trains, starting every few minutes, will be run at high speeds. The advantage of the small unit train sent out under a system of despatch at brief intervals is appreciated by the public, and its economy understood by the railways.

ONE HUNDRED MILE SPEED.

Germany in its experimental electric railway work has obtained the most astonishing results in speed, but there is exhibited at the St. Louis Fair a new form of railway which promises even more remarkable results. Stretching from the two side rails there is an iron framework supporting a center rail, raised about four feet from the ground. So securely is the car hung over this, that it would seem almost impossible for it to leave the track. Thirty-four and one-half miles of this road are now being constructed between Manchester and Liverpool, with the expectation that the distance between these cities will be covered in twenty minutes, or at the rate of nearly one hundred and four miles per hour. There will be no switches, and no stops. At either end there is a sharp grade, intended to accelerate the speed in starting, and to aid in braking the train at the stop.

RAIN-COAT WORN IN THE PHILIPPINE ISLANDS

Electric locomotives for use underground are

shown at the Fair in many forms. There are mines in which the entry is so low that a live wire would endanger life at every moment. This difficulty is met with an arrangement by which power is supplied through an insulated wire, reeled up on the locomotive, and which coils and uncoils as the engine advances or retires along the rail.

Another important form of electric-car development is

THE TRACKLESS TROLLEY.

Not much attention has been given in the United States to the idea that electric cars can be operated on asphalted highways by a trolley following a public overhead wire. This is such a simple method, however, and so inexpensive in construction, that if other forms of passenger and goods transportation do not come to the front within the next twelve months, we may expect to see it availed of in many directions. The cost of stretching a trolley-wire is only a few hundred dollars a mile. These wires could be rented to machines which would carry upon them an indicator of the power used, or at a certain fixed rental, the current being furnished by towns which do their own electric lighting, or by companies.

Since the Chicago Exposition the advances have been wonderful in

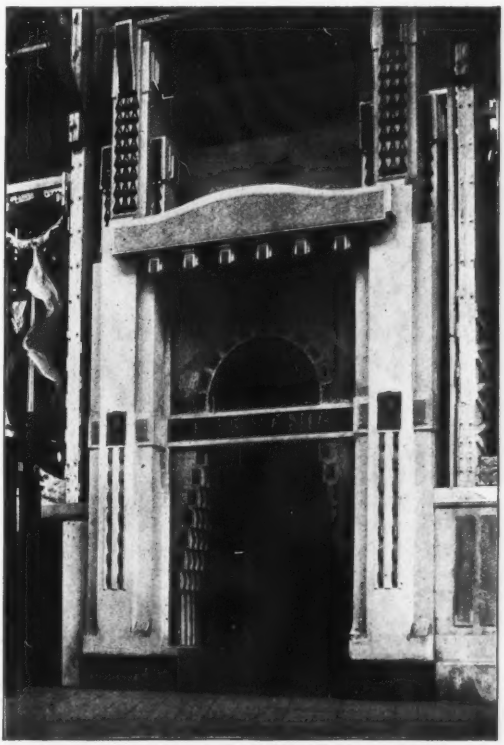
TROLLEY-CAR IMPROVEMENTS.

In the exhibit of the General Electric Company at St. Louis, a trolley-car is raised six feet from the floor, so that one may inspect the perfection to which the devices in this class of transportation have been brought.

A defect in modern street-car service which every passenger has been able personally to note, is the sudden starting or stopping of a car by an inexperienced motorman. Under the new practice the motor is thrown wide open at the instant of starting. With the old appliances this would jerk the passengers off their feet, and perhaps strip the gears. Not so in the new. Automatic apparatus turns on, first a portion of the power, then another portion, then another, and finally within ten seconds the entire force is being used smoothly and without endangering either passengers or machinery.

Another recent invention is a button which rests under the hand controlling the power. This must be pressed down if the car is to be kept in motion; at the same time the hand is left free to turn the controller. But should accident happen to the motorman, no longer may the car go wildly careering along its way. The removal of the hand releases the button and this acts automatically; the power is closed down, and at the same moment the air-brake is set.

The latest street-cars exhibited at the Exposition show air-pumps and -brakes the same as on steam railways. Air pressure gives an opportunity to employ a warning whistle instead of the clanging gong.



ENTRANCE TO A PORTION OF THE GERMAN EXHIBITS—DESIGNED BY BRUNO MÖHRING.

WATER PARADE ON TRANSPORTATION DAY—A WAR-CANOE FROM THE SOUTH-SEA ISLANDS.

One of the most important improvements in trolley-car practice has relation to the use of the alternating current direct on the car without being transformed.

PROGRESS IN GENERATORS, TRANSFORMERS AND MOTORS.

Motors are now being built to give just enough power to run a sewing-machine, and generators are constructed up to ten thousand horse-power.

Endless exhibitions of ingenuity are given in connection with the use of electric motors. One is that of a gate-valve for closing, in case of breakage, the water-mains of a great city. A matter of minutes in closing off pipes has meant in New York city the saving of tens of thousands of dollars of property. The apparatus as shown is so arranged that by simply touching a switch an electric motor, distant many miles, begins to close down the valve—an operation in the olden days that might consume perhaps an hour before the valve could be reached by messenger.

For use in factories where buildings are irregular, or where the pieces of machinery are large and used only at certain periods, as in the case of daily newspaper presses, the electric motor has become invaluable. It is being adopted, however, in factories where it is possible to have a single straight line of shafting, and where the machinery is used steadily. In cases of this kind, I do not believe that it equals in either economy or efficiency the ordinary straight-line shaft.

PROGRESS SHOWN IN ELECTRIC LIGHTING.

At Chicago there were only the incandescent and the arc light. Since then there have been invented, first, the Nernst, second, the Bremer Arc, and third, the Cooper Hewitt Mercury or Vapor lamp. Each of these serves a different purpose.

The Nernst light furnishes almost exactly the rays we are accustomed to in sunlight. It is, therefore, highly valued in stores where articles in color are sold. It is also extremely bright and therefore a valuable light for reading.

The Bremer Arc is a new light differing from the old arc in the following particulars: It furnishes rays which are yellower and less ghastly than the common arc. The construction of the lamp itself is an improvement over the old, in that the rays are brought to bear more effectively on objects below; and there is not that dense shadow which is found under the original arc light.

The third new light is the Cooper Hewitt, which has come to be valued by photographers and photo-engravers. This is said by some photographers to be the most important advance in photography since the invention of the dry plate. In some establishments in New York, photographers have dispensed

MISS ROOSEVELT AND HER FRIENDS ARE AMUSED AT THE MANNERS AND CUSTOMS OF THE FILIPINOS.

with the skylight and are working entirely with the Hewitt lamp.

Both the Westinghouse and the General Electric Company have rooms fitted up in which they compare the light-values of the several lamps. In the General Electric's room the Mercury Arc lamps are in tubes two feet long by an inch in diameter, and the claim is made that it requires but .6 of a watt per candle-power as against 3.5 to 4 watts per candle-power consumed by the ordinary incandescent. However, having no red rays, this lamp is at present unavailable for general lighting purposes, but acts admirably for photographic work, blue prints, et cetera.

An ingeniously contrived machine shows the color-values of these lamps. Looking through the same eye-piece, one beholds a piece of cloth under daylight. Alongside of this is the same cloth under the Mercury Arc; again we have it shown by the incandescent; and still again by the arc—a test which should be valuable to merchants or manufacturers, to whom true color-values are important.

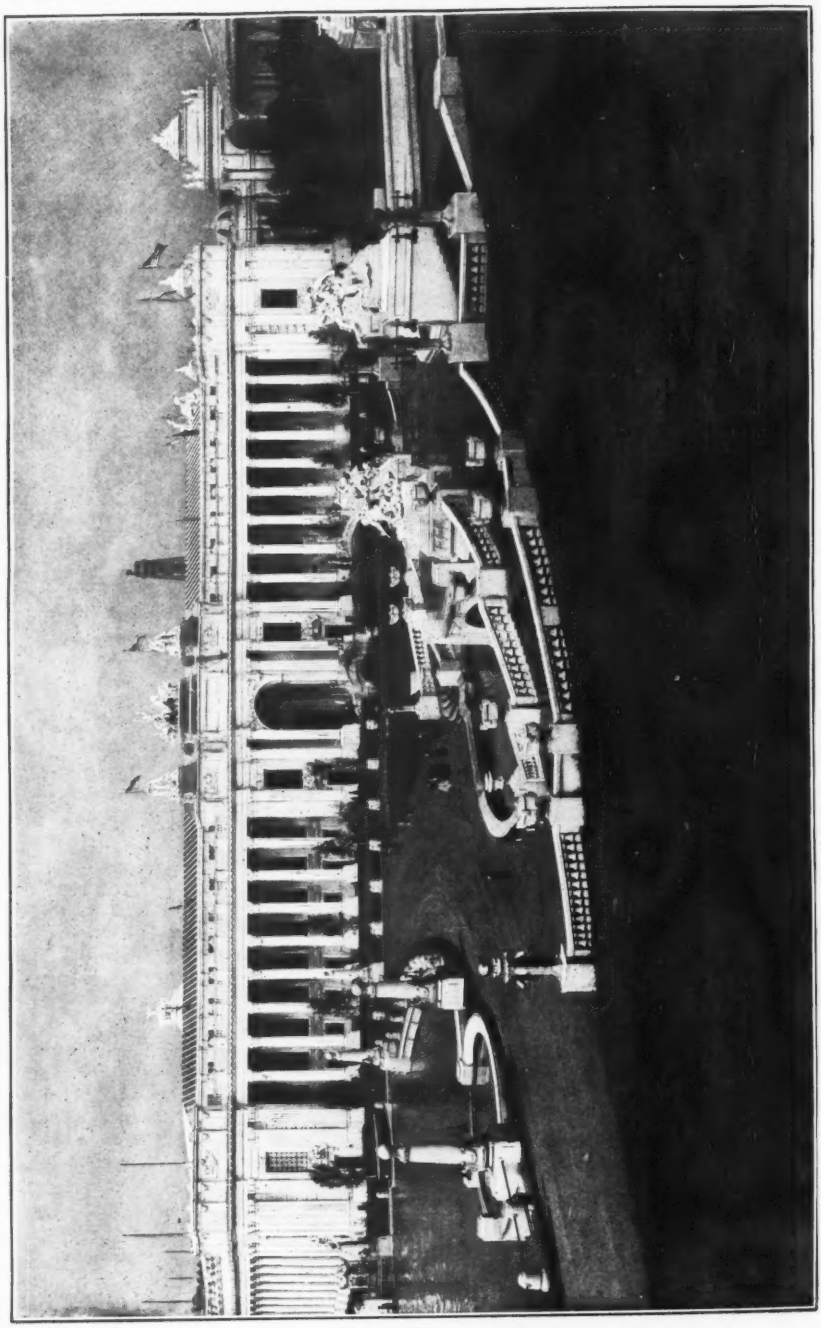
AUTOMATIC TELEPHONY.

The chief progress in telephones has reference to automatic operation. There are automatic switchboards and automatic exchanges. There is also shown Prof. Graham Bell's radiophone, a discovery by which is made possible the sending of a verbal message along a beam of light. The growth in the use of the telephone since the Chicago World's Fair is almost beyond figures, and it is now employed in every form of business, over distances ranging from a dozen feet, communicating with an adjoining room, to a thousand miles. The modern hotel is equipped in every room with a telephone; and the modern man of large affairs is found at a desk on which stand perhaps a half dozen telephones, transacting his business by wire.

TELEGRAPHING ONE THOUSAND WORDS A MINUTE.

One of the mechanical wonders of the Exposition is an instrument which sends one thousand words a minute, over lines a thousand miles in length, against the human operator's fifty words. Indeed, it can send twenty-five hundred words a minute over shorter lines. Yet the price of telegraphing ten words for twenty miles in the United States remains twenty-five cents! This exhibit illustrates the defects of private ownership of public utilities more strongly than almost any other at the World's Fair. If the government had charge of our telegraphs, as it has of distributing our mail matter, we should undoubtedly have in use this thousand-word-per-minute mechanical telegrapher; and there is another device, by the way, which mechanically puts the words into type. It is scarcely to be doubted that if this were operated by the post-office we could transmit messages of fifty words for ten cents, and two hundred words for twenty-five cents. In this day of prompt action it would be difficult to estimate how great a benefit this would be to commerce and

THE NEW YORK STATE BUILDING ON THE STATE PLAZA.



SOUTH FRONT OF THE PALACE OF EDUCATION AND SOCIAL ECONOMY FROM THE CASCADE GARDENS.

to the facilitating of business generally.

ELECTRIC TRANSMISSION OF WRITING.

There was at Chicago, up in a side gallery, a little machine called the telautograph. It was located in so obscure a position that no one saw it; yet it was one of the world's great inventions. It was said that rival interests had secured its being so placed. Little progress has been made in its use because it was opposed by vested rights. It enables one to write a message, and a facsimile of the writing immediately appears at the end of the telautograph line. The first public use I ever saw of it was a few days ago in Philadelphia. Four instruments were placed in a newspaper window and used as bulletin-boards. As a subeditor, upon his machine in the rooms above, wrote out a bulletin, a facsimile bulletin immediately appeared upon each of the four machines.

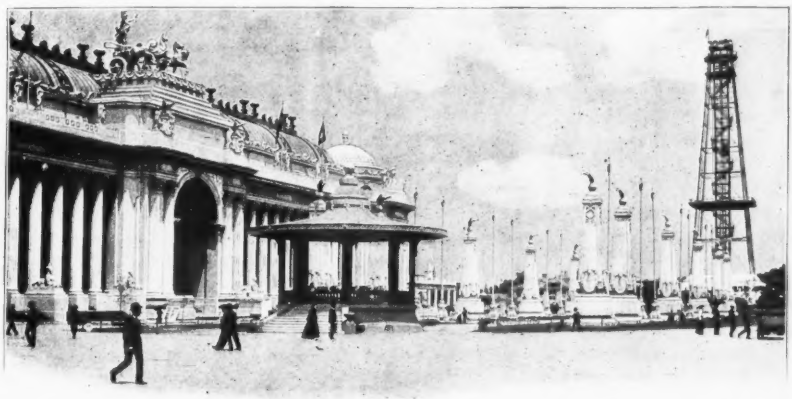
There are a thousand ways in which this machine could be made useful under government ownership. Under private control of the public transmission of messages, the world has been robbed of this valuable invention. For instance, the ticker which gives the news laboriously to the offices in the great cities would disappear, and the same cost would furnish service which would practically cover all the news of the day written out in plain handwriting, or type for that matter, so that the subscriber might keep thoroughly posted.

And it seems not improbable that this is one of the forms that the newspaper of the future will take. In every house which can afford it there will be a telautograph upon which will be unrolled the news of the world as it transpires from hour to hour.

Another invention in this same direction was not exhibited, but is announced in the newspapers. It is a combination of telephone and phonograph. If away from the office, the owner adjusts a phonograph apparatus which records on its wax cylinder messages received during his absence—an improvement upon the ordinary office-boy.

HEAT BY ELECTRICITY.

This is another phase of electricity which has been brought forward in a practical manner since the Columbian Exposition.



OPERATING-STATION OF THE DE FOREST WIRELESS TELEGRAPH AT THE REAR OF THE PALACE OF MANUFACTURES.

In the chapter on Woman's Progress, the question of individual cookery at table on small electric nickel-plated slabs is fully discussed. Undoubtedly this will be one of the most rapid developments in the use of electricity in the near future. It is interesting, therefore, to note in the "Scientific American" of July 23d an article on the cost of electric heating, which says:

"Efficiency in electric heaters is perfect at one hundred per cent. In other words, all of the energy absorbed as electric current reappears as heat.

"This is true of no other type of heater. An ordinary coal- or wood-stove gives off

only one-quarter to one-half of the heat energy of its fuel. Radiators in the best steam- and hot-water plants yield about seventy per cent. of the latent heat of the coal burned in their boiler furnaces. Probably fifty per cent. is as high an efficiency as can ordinarily be expected with gas-stoves.

"In almost every instance where combustion is employed to develop the heat for industrial operations there is a great and necessary loss between the fire and the object to be heated. . . . Where electric heaters are applied to industrial operations, most of these losses just named are avoided because the energy is transformed at or within the object to be heated. Thus an electric stew-pan has the heat developed in coils attached to its bottom, and such coils are actually within the electric smoothing-iron. This feature gives electric heating a great advantage in point of economy for most industrial operations."

In the New York Building at the St. Louis World's Fair, the cooking is done entirely by electricity. It is to be regretted that this exhibition was not considered of enough importance to be duplicated where the public could have it under full view. There are a thousand ways in which electric heating will rapidly come to the front in addition to that of warming street-cars, which is already well developed. In those sections where power can be obtained cheaply from waterfalls, or from low-priced fuel, it should become a favorite method of heating the house.

The space allotted to this article has already been greatly exceeded and we shall be obliged to dispense with the mention of many specialties which are interesting and should receive attention. Notable among these are Elihu Thomson's oil-switch, which handles sixty thousand volts as if they were a child's toy, and electric welding, which has been brought to such perfection that apparatus can be carried to a railway track and two rails joined as solidly as if they had passed through the rolling-mill in united form.

The use of electricity for smelting metals is another form which has been highly perfected, but which is of so special a character as to have no great public interest. There are smaller inventions which are notable, such as a mercury rectifier intended to be used in private establishments or in automobile garages to convert an alternating into a direct current for the purpose of charging batteries. This consists of several small glass tubes containing mercury, which seem to be perfect for the purpose required, yet of the most inexpensive construction.

In conclusion, I venture once more to repeat the prophecy that because our experts have hitherto been groping in the dark, through a wrong understanding of matter, progress will be one hundred-fold in the next decade, proceeding with accurate knowledge of this truth, the most important which science has thus far discovered.

And it is possible that at the next World's Exposition will be made clear what is "Gravity."

EXPERIMENTING WITH AN APPARATUS FOR WIRELESS TELEPHONY.

REPRODUCTION OF A ROOM IN THE STYLE OF THE FLEMISH RENAISSANCE.

XIII. NEW HOUSEHOLD METHODS AND ART AS EXHIBITED AT THE EXPOSITION.

By John Brisben Walker.

As expositions show the march of civilization, it is worth while to compare the advances in simplifying home life, in the direction of scientific organization by the introduction of household utilities, and in improved methods adopted, during the eleven years since the Chicago World's Fair.

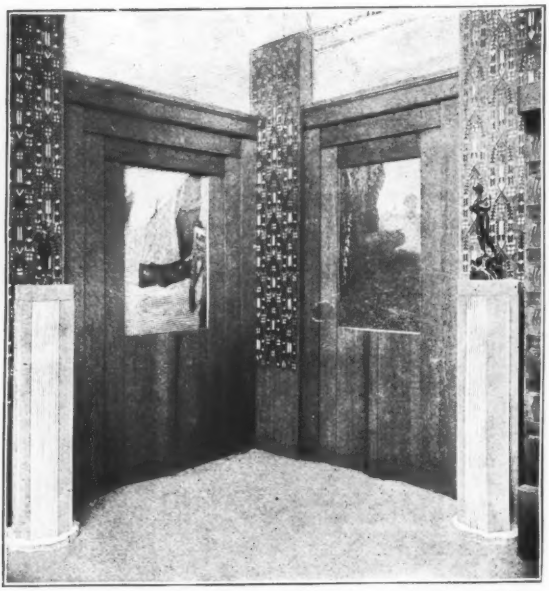
Germany excels in household art as in a hundred other ways throughout this world exposition. I was informed by the official in charge that no such display of household decoration had ever been made of German product, even in Germany itself.

As you enter the main hall, you are impressed by the striking architectural features: the combination of simplicity, of the beautiful and the novel. Beginning with ancient Egypt, it embraces something of the past on up to the present day. It is the true art—that which seeks not to be held in leash by a school or a period, but takes all that is noblest and greatest and combines them into a harmonious whole.

In a day of garish adornment, or vulgar ostentation, when the mere spending of money seems to be regarded as art, it is refreshing to find such perfect ideals as those given in house-furnishing in the German section. The most perfect are those of the simplest forms. It is notable that wherever they get away from simplicity they lose in art.

Three features stand out in one's recollection of the dozen or more beautiful apartments. First, the wonderful windows, in which such charming effects are produced by materials of the simplest character. Next, that in nearly every room there is a fountain, in most cases an inexpensive one, with a little water trickling, giving the melody of falling drops. And lastly, the fireplaces so designed as to be things of beauty and a constant joy, instead of the inartistic and unreasonable and inexcusable creations which so often mar American houses.

Perhaps it is not quite fair to have in



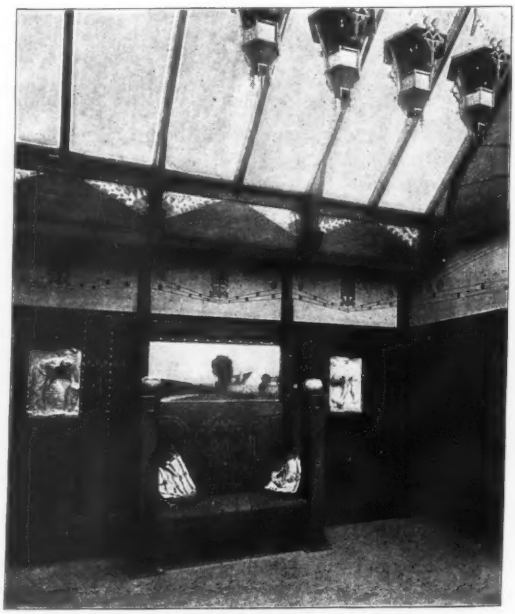
GERMAN ARCHITECTURAL EXHIBIT—CORNER OF A LIBRARY READING-ROOM, DESIGNED BY PROFESSOR OLBRICH, OF DARMSTADT.

mind these beautiful things which are the masterpieces of Germany's most noted artists and place them in comparison with products that are not costly and are turned out by the thousand for American homes.

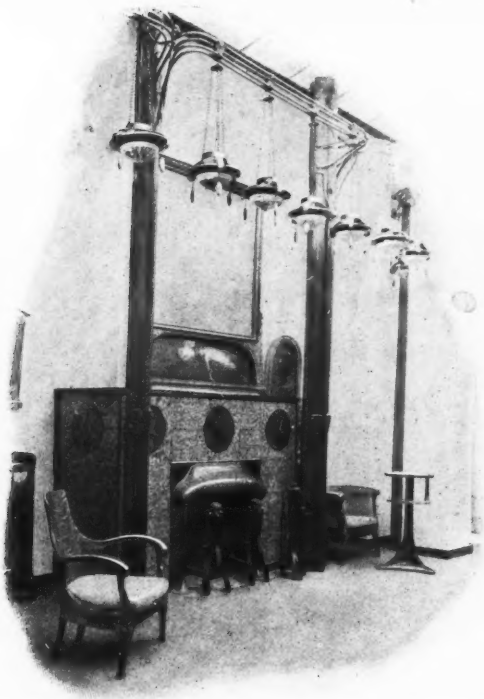
The director of this exhibit, Herr Wachlicht, was kind enough to go through the exhibit with me, and courteously enabled me to secure the photographs which represent some of these features.

Wandering among these German masterpieces, I was impressed with the educational feature of such an exhibit as tending to develop our own industries and the almost generosity of the people which sends to America its best things, well knowing that not only shall we admire and buy, but that our own taste will be raised up and our own mechanics copy the best of them.

Mention has been made, in the article under Woman's Progress, of the proposition to revolutionize the entire method of cooking, not along the line of Charlotte Perkins Gilman's ideal of a great caravansary doing the work for all, but of so simplifying cookery by the aid of an electric stove placed directly on the breakfast-table, with heat applied as required, that every one will take delight in being one's own cook. That prospect, however, will not prevent the average woman at the Fair from enjoying some of the kitchen exhibits, with their delightful display of polished brass, tin and nickel.



CORNER OF A STUDIO.



GERMAN ARCHITECTURAL AND HOUSEHOLD ART EXHIBIT—A FIRE-PLACE DESIGNED BY CURT STOEVING, OF BERLIN.

Let us take one of these and note those features which have been designed since 1893. Here is a combination range, one end of which is for coal and the other for gas. If a light meal is to be prepared, the gas end of the stove answers every purpose. If, on the contrary, the cooking is to be prolonged, coal becomes the more economical. In cases of emergency, both coal and gas come into play, doubling the capacity of the stove.

But this is not all. There is even a third means of cooking—a charcoal-pit in the center, which is used for fine broiling. And even this does not embrace all of the novelties in this twentieth-century stove, for underneath the baker in the gas section is a gas-broiler. Both ranges connect with the water-tank under pressure and have water-backs, so that no matter which stove is used there is always hot water.

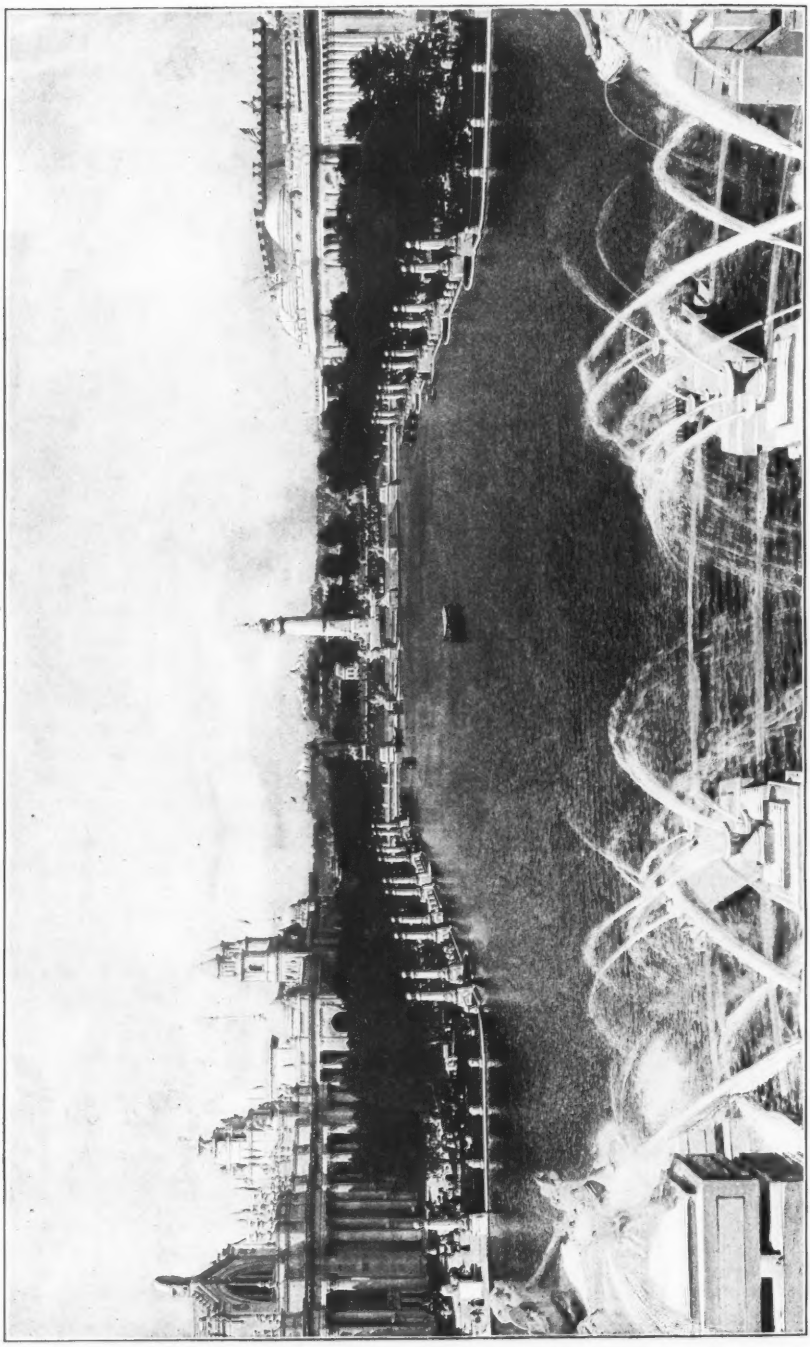
The hotel ranges in this exhibit, with their array of bright pots and kettles, constitute a most fascinating display for the eye. A confectionery stove is also shown. It has a low cylinder, and the top is composed of rings of metal which can be successively removed, giving places for five different sizes of kettles. The stove is constructed to burn charcoal, coke, coal or wood, and is convenient for households as well as for hotels.

A novelty in stoves is a battle-ship range, with steel racks for preventing the pots and pans from going helter-skelter in a high sea, and with ingenious braces for holding the range itself in place. A Mexican charcoal-range is another novelty, with shallow grates for charcoal immediately beneath the lid.

An "institution" coffee-urn, having a jacket half-way up for the admission of live steam, and capable of containing two thousand cups of coffee, impresses one as something perfect of its kind. Glass gages show the amount of coffee in the urn, and measure off the number of gallons held at any moment, while brass cocks and a lid swinging on a movable crane leave nothing to be desired in the way of convenience.

In these days there are batteries of all sorts of things, as well as of Japanese guns. I confess that a battery of coffee-urns is the latest—and perhaps scarcely less deadly than one of the rapid-fire order. In the two side urns the coffee is held in bags inside of the cylinders, and around the cylinders are jackets of hot water. In the center tank live steam heats water to the boiling-point. From the tank the water is carried to the coffee in the bags, and thence is dropped to the urn below, where it is kept heated by the surrounding jacket of steam.

The Russian samovar, for making tea, which is also exhibited, is on somewhat the same principle, without, however, the



Copyright, 1904, by Louisiana Purchase Exposition Co.

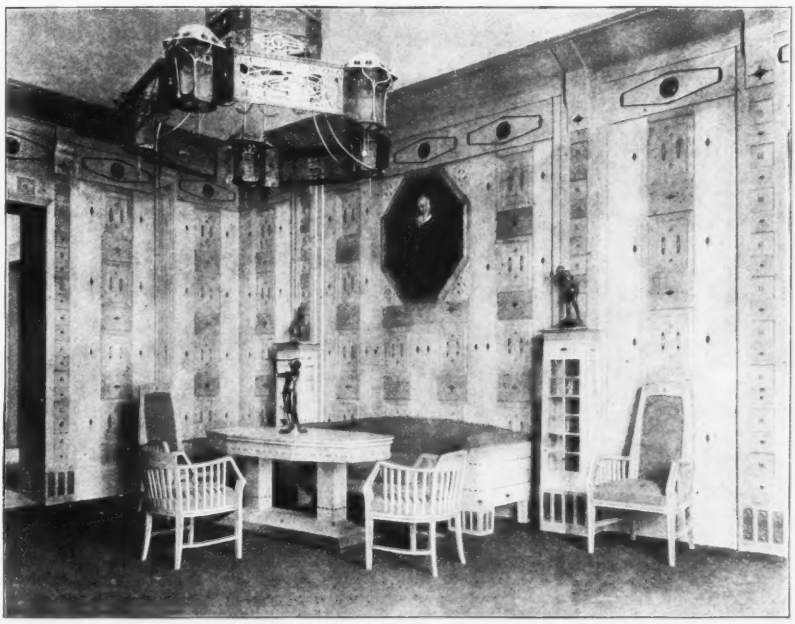
VISTA OF THE PLAZA OF ST. LOUIS, THE GRAND BASIN AND ADJOINING PALACES; THE CASCADE FOUNTAINS IN THE FOREGROUND.

convenience of live steam. In this the spirit-lamp passes its heat up through a central tube, extended to the top, and does not, as in the extravagant American contrivance, waste the heat around the sides.

"Fascinating" is probably the only word which a woman would apply to such instruments as the hotel nickel-plated griddle and the turning waffle-irons. It is equally a good word to describe the impression on the male eye. Many small cocks regulate the flow of gas, so that one part or another of the griddle may be heated as required and no heat wasted. Below it are a toaster and a drip-pan.

Another tool for the hotel is an automatic potato-masher. A trough with metal perforations, a roller resting on this, guided by the hand from a lever, and sieves of many sizes, are parts of the apparatus.

More complex in structure is an automatic egg-boiler. On one side are a trough filled with hot water and four metal baskets to hold the eggs. From each basket a chain passes up over a pulley and is connected with a cup into which water is admitted through a graduated faucet. In three, four or five minutes, as one may desire, sufficient water is accumulated in the cup to overbalance the weight of the eggs in the basket, and they are drawn up automatically, at exactly the right time, out of the water. There are a number of compartments at the top (presumably for the hen to lay in!) and it is only necessary to fix a tube to pass the egg down into the basket.



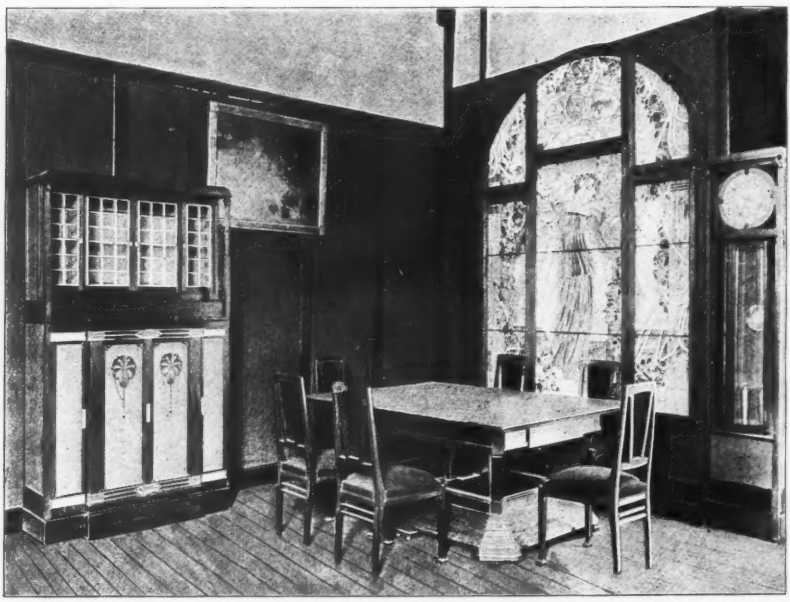
GERMAN ARCHITECTURAL AND HOUSEHOLD ART EXHIBIT—REPRODUCTION OF THE PRESIDENT'S ROOM IN THE GOVERNMENT BUILDING AT BAYREUTH, DESIGNED BY RANK BROTHERS.

Even the problem of dish-washing without soiling the hands—that bugbear of the household—is in process of being solved. A handsomely nickeled chest contains a wire basket swinging on trunnions. Into the basket the dishes are put and are then lowered into a tank of hot water. A lever enables the washer to agitate the dishes without breaking them and with the absolute minimum of exertion to herself. After the first washing, the basket is lifted by handles and transferred to another compartment in which live steam is admitted,

which thoroughly cleanses them of all grease, et cetera. The heat created by the steam even serves to dry the plates.

Since the Chicago Fair, bread-making apparatus has been perfected for use in small families. There are inexpensive machines which mix the sponge. Then, after being raised for only three hours, an automatic kneader takes possession of the dough. Bread-making in this way becomes a sure and scientific operation.

There has been much progress in the keeping of the house in a healthful condition. Refrigerators are more scientifically constructed, the art of disinfecting is better understood, and plumbing is perfected and left open to inspection. The lighting of a house is softer and more artistic and less costly.



GERMAN ARCHITECTURAL AND HOUSEHOLD ART EXHIBIT—A DINING-ROOM DESIGNED BY ANTON HUBER, OF BERLIN.

Perhaps the most noted single pleasure-giver brought into use since the Chicago Fair is the automatic piano-player. Forms of this device are exhibited at the Exposition in great variety, several of them almost as perfect as one could wish. They have already brought delight into a hundred thousand households. The tired man of business finds his evening's recreation in going over the greatest masterpieces and interpreting them as they appeal to his fancy. The young child familiarizes himself with the best in music. Country homes miles away from musical recitals and from theaters have the long evenings enlivened by this new invention. It brings within the reach of the humble household the most classical music and gives a range that covers every great musical work at a cost that is almost nominal.

There are now no fewer than twenty-nine of these automatic players. They are pneumatic, electrical and mechanical. There were two hundred and thirty-eight thousand pianos sold in the United States last year. The statistics are not at hand regarding the number of mechanical piano-players, but it is quite probable that within a very few years the number of these instruments turned out will fully equal the number of pianos annually manufactured. There is no single thing which has come into American life since the Chicago Exposition which gives so much of pleasure that is elevating, which has the

PORTION OF EXHIBIT OF THE IMPERIAL ROYAL SCHOOL FOR ARTS AND CRAFTS OF THE AUSTRIAN MUSEUM, VIENNA.

power of diverting so many people from the harshnesses of life, as the automatic piano-player.

One of the crudities of American life is the silver-plated knife for cutting meat. It exists only because of the ignorance of the average housewife, who does not know that there are machines which clean a

GERMAN ARCHITECTURAL AND HOUSEHOLD ART EXHIBIT—DINING-ROOM DESIGNED BY ALTHERR AND ORTLIEB, OF BERLIN.

knife rapidly, both sharpening and polishing with minimum effort. The cost of this machine is from four to twelve dollars. The English brush-machine, with emery, which takes from four to twelve knives at a time, is probably the best, although the most expensive. The pleasure of always having a steel knife at the table, not only perfectly bright but sharpened, can scarcely be appreciated by those who are accustomed to use the dull, silver-plated article. And the same observation applies to the great hotels. It is a constant wonder that those barbaric customs still exist in the face of such improved machinery.

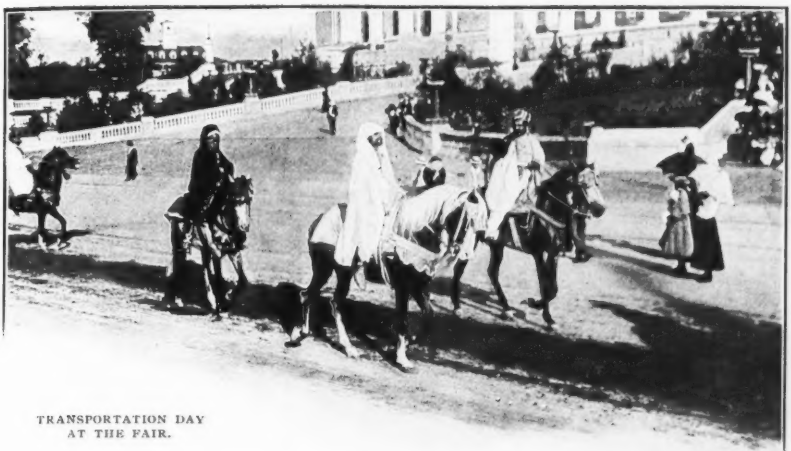
One of the exhibits is a small electric elevator, a device which will make the housewife's duties easy. The old-fashioned house elevator was dragged by hand, and now and then a load of dishes went with a crash to the bottom.

GERMAN ARCHITECTURAL EXHIBIT—READING-ROOM OF A SMALL LIBRARY, DESIGNED BY PROFESSOR OLBRICH, OF DARMSTADT.

In the new elevator, shown at the Fair, the servant touches neither the cage nor the cable. For each floor of the house there are two buttons, and opposite them is written the name of the floor. To whatever floor you wish the car to go, you press the button with the corresponding number, and there the car goes. The same principle is applied to house elevators for passengers, so that no operator is required.

Another of the advances since Chicago is in radiators and steam-heaters. As I recall that earlier exhibition, there was not shown a single artistic form of those appliances; they were commonplace beyond degree. Now, however, the highest art has been brought into play in the designing of register plates, and especially beautiful are the forms which have been given to the radiators themselves, over fifty variations furnishing an opportunity for the gratification of every taste.

There are many artistically arranged furnace exhibits at the Fair, but perhaps none more novel and attractive than those of household heating apparatus. The difficulty of taking commonplace materials and making of them an artistic exhibit is easily understood when one recalls how ordinary is the average display of this character. One establishment has erected an attractive double house with hall in the center—all open in front to show the half-basement, the dining-room, parlor, bedrooms and bathroom. In these are installed the various kinds of radiators, and in the cellar the hot-water heater is shown. Serving as gateposts and arch are two steam-heaters with their pipes meeting overhead. The color-scheme is admirable, and the whole display is attractive. It is more than this, however. It gives the housewife, who may know but little of engineering, some idea of how her house is connected and of the part which everything plays in the arrangement. There is a garden in which radiators seem to grow as flowers, and a neat white fence built of radiators on the outside.



TRANSPORTATION DAY
AT THE FAIR.

ARABS RIDING THROUGH THE EXPOSITION GROUNDS.

XIV. THE WALLED CITY OF JERUSALEM—IN ST. LOUIS.

By John Brisben Walker.

THE idea of building an entire city as a side-show to an exposition is a bold one. The Jerusalem of the Louisiana Purchase Exposition was conceived on a large scale. The area enclosed by the walls embraces no less than eleven acres, and there are in all twenty-two streets. The narrow highways are occupied by houses copied from those of Jerusalem, converted for the time being into booths, along which are exhibited many articles to tempt the dime and quarter of the visitors. There are reproductions in staff of the most noted places in Jerusalem, including temples large enough for a thousand men and women to worship in.

As I went up one of these steep, narrow streets, a crowd came surging in from a side way much as it might have done round the Galilean bearing His cross, in days of old, from Pilate's house to Calvary. I joined the procession and followed to the Sepulcher, where the guide leading the party delivered a lecture on the sacred places.

We visited chapels, temples, the tower of David, and the wailing-place of the Jews—the latter being the subject of one of the great paintings of Verestchagin, whose valuable life was so lately lost on the great Russian battle-ship which went to the bottom off Port Arthur. There are citadels, moats, the American consulate and a foreign hotel, with camels and donkeys and fez-covered Eastern peoples pursuing their vocations in the market-place, where life was going on with comfortable indifference to the Christian visitors.

In this public square tranquilly sat a Turk smoking his hooka, the bubbling water-bottle and pipe resting on the ground at the end of the long, flexible stem. The look of placidity on that face is not to be described. "God is God, and Mohammed is His prophet," it said, and all other things mattered not. He spoke English, and I found him to be a true philosopher.

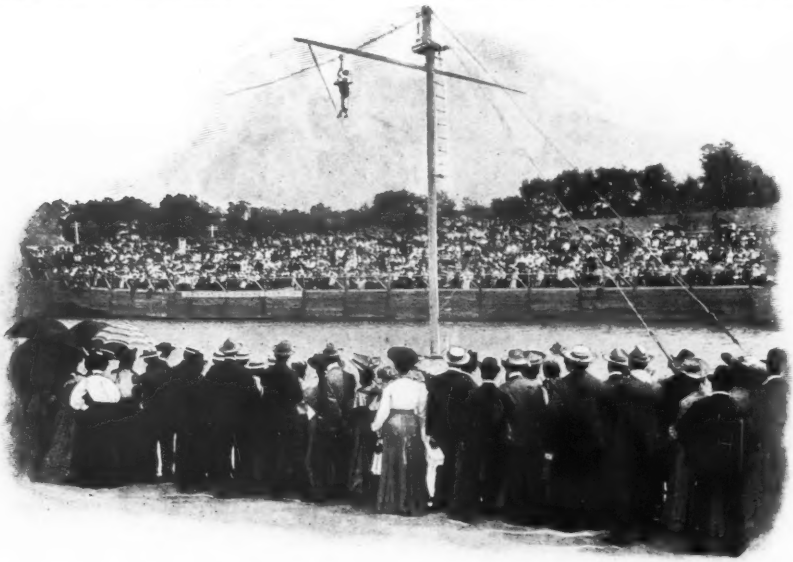
There are fortune-telling bazaars in Jerusalem where a dozen operators are kept busy by a gullible and curious public. Desiring to do the Exposition thoroughly, I selected one of the most intelligent-looking of the fakirs, and held out my hand. His statements were general and flattering, and I was constrained to remark, after two or three of them, that any one would be glad to hear comment of that nature. After two or three more, I again interjected that his information was of a kind that would be agreeable to the

average man or woman. This second remark evidently nettled the soothsayer, and for a moment I hoped I had aroused him from his usual line of procedure, which is to make much of the capacity of his clients for flattery. But the custom of his profession could not so easily be departed from, and he continued to the end with glittering generalities of a nature that made him literally a soothsayer; and many a country boy and maiden, and city-bred too, for that matter, will, around this winter's firesides, revive the story of fortunes told in this modern Jerusalem.

The lights are turned down and night comes over the great camp, with its two hundred thousand fighting-men. For a few minutes the audience is left in silence, and the imagination has an opportunity to play. Presently the rays of the morning sun break over Sinai, gradually tingeing the peaks to the foothills with turquoise until they reach the valley and light up tents and people and priests hurrying to the Temple for morning service.

Then back we go into the streets with their bazaars.

"From Jerusalem?" I asked one of the



PRACTICAL EXHIBIT OF THE UNITED STATES LIFE-SAVING SERVICE—A RESCUE WITH THE BREECHES-BUOY.

The Temple of Solomon is not the least interesting of the sights within the walls of Jerusalem. It is a reproduction in miniature from the most reliable authorities, and an intelligent young man makes a good lecture on what is known of the Temple and people. In another part of the room, a huge canvas purports to show the camp of the Israelites at the foot of Mount Sinai, with its tents for eight hundred thousand men, women and children, laid off in great streets in the center of which is placed the Holy of Holies. Replicas of the altars, candlesticks and sacred implements are also shown.

native attendants, for I had read in the official guides that a thousand Jerusalemites had sailed to take part in these performances.

"Yes," he said, "from Jerusalem."

"How long since?"

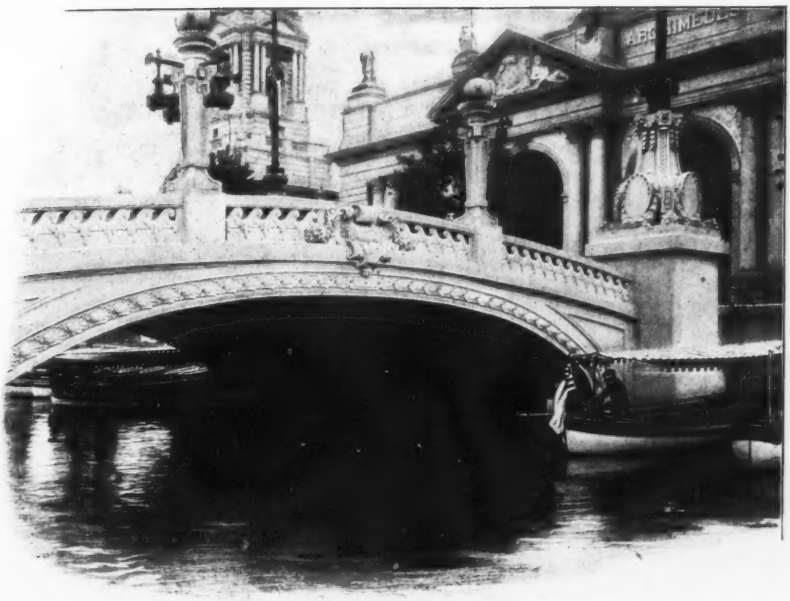
"Two months."

"There is nothing like this," I said, "at Coney Island."

He answered very knowingly in very good English, and then seeing my smile, he said:

"I have a push-cart in New York, and live in Hoboken."

But, notwithstanding this discrepancy, the walled city of Jerusalem in St. Louis is an interesting and instructive place to visit.



BRIDGE OVER WEST LAGOON CONNECTING PALACE OF ELECTRICITY AND PALACE OF MACHINERY.

XV. ART AT THE EXPOSITION.

By John Brisben Walker.

I CONFESS to a feeling of profound disappointment with reference to the art displays at the Exposition. To begin with, nine-tenths of the statuary is commonplace to a degree. There is an absence of intellectuality; the work of copyists everywhere abounds.

An artist is called upon to represent "Transportation by Land," and he can think of nothing better than a woman with an expressionless face holding a toy locomotive on one arm as she would a poodle-dog. Another artist, or probably the same one, when he comes to represent "Transportation by Water," has another woman, very likely the same model, but this time, in the astonishing versatility of his genius, he puts into her arms a toy ship—again held à la poodle-dog. War-chariots do duty above buildings intended for the most varying purposes.

One searches almost in vain for originality of conception, or for the work of an artist behind whose molded forms lies a worthy thought. Occasionally there is a statue which shows the intellect of the true sculptor, as in the case of Daniel C. French's "Napoleon," in which the world's greatest genius sits, map in lap, pondering the necessity of parting with his empire in North America. It is an attitude of profound melancholy; the prophetic mind beholds clearly the great republic which will one day occupy the lands which he is turning over to the United States. This statue will remain, after this World's Fair, one of the most notable "Napoleons."

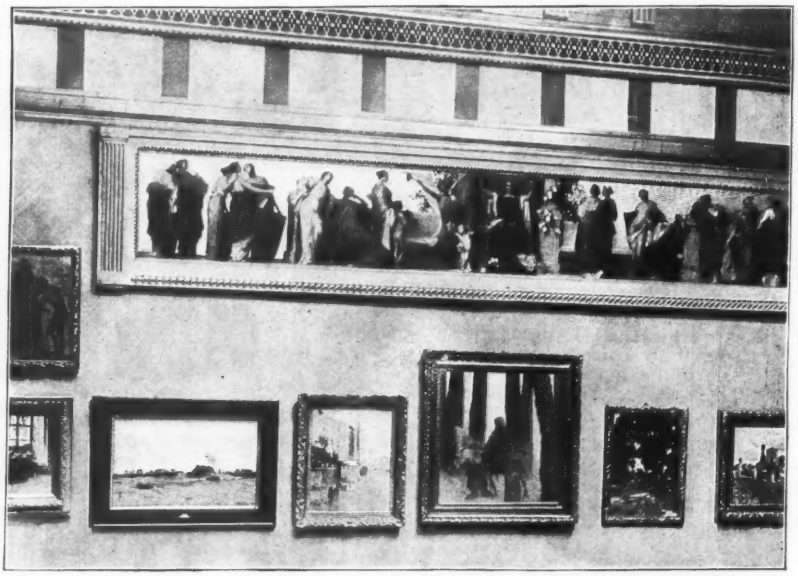
Occasionally a sculptor escapes from his "beaux-arts" studies of Greece and Rome. The result, however, is scarcely more happy, for in front of the Pike we have fixed in staff a drunken orgy—an inconceivable embodiment designed to perpetuate three of the lowest types of Western cowboy. Certainly a misunderstanding, to say the least.

I took a committee of five, two of them selected for their knowledge of art, through

the vast art-galleries of the Exposition—in which are displayed a greater number of square yards of mediocrity than have ever been brought together before in the history of the world.

It was my intention to pick out and reproduce ten really great paintings, or, at least, ten great enough for three out of five of the committee to agree upon. I have always entertained the theory that a truly great painting will be recognized as such by all classes of people. It may require a connoisseur in art to tell the points of a moderately good work, but a subject which three out of five persons would agree. I went out in a melancholy frame of mind, determined to return and find the secret, if I could, of such vastness of commonplaceness.

Upon my next visit I wandered through the rooms alone. Gradually it seemed to become clear. The art-schools of to-day teach method, technique; they do not teach students to think, or to express thought in original ways. The man or woman becomes a copyist or attaches himself to some fad. There are many artists like unto those novelists who attempt to write without ideas. They are not infre-

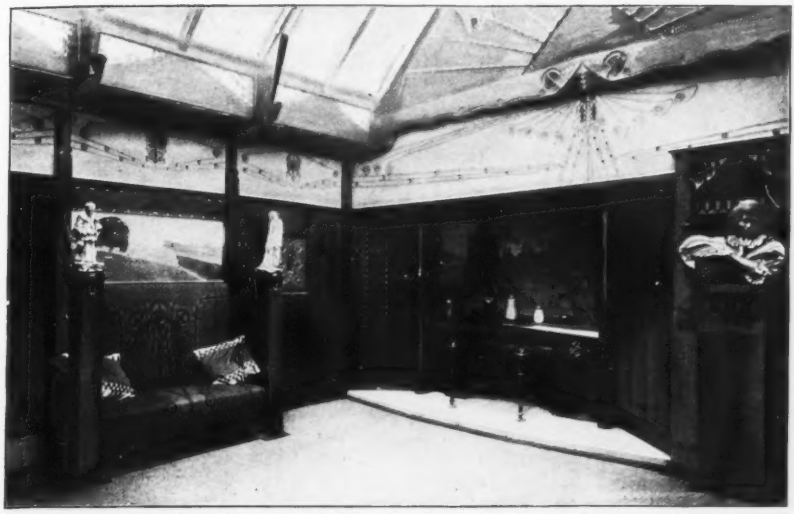


A PORTION OF THE ART EXHIBIT, SHOWING THE BEAUTIFUL FRIEZE IN ONE OF THE ROOMS OF THE PALACE OF FINE ARTS.

rendered in a really strong way stands out evident to all.

It was with surprise, then, that as my committee reached the last room I discovered that we had not secured the necessary three-fifths vote required to complete our list of ten.

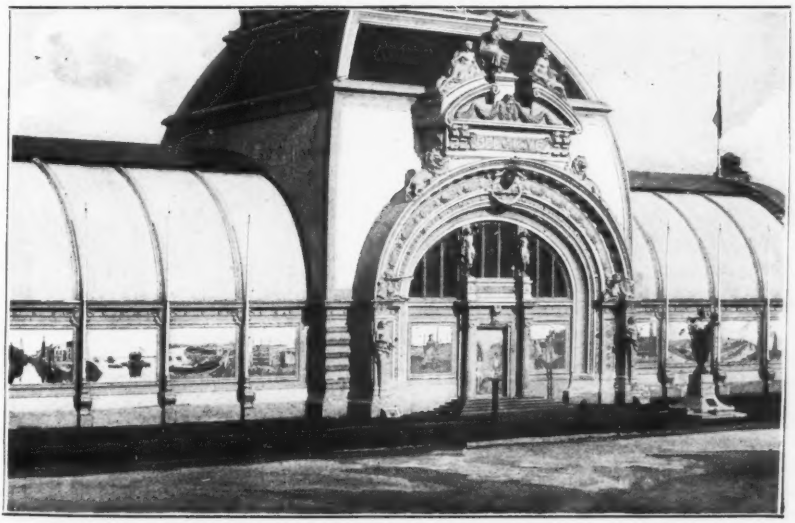
Of those selected, three were taken from painters of other times recognized as great masters. Yet here were thousands upon thousands of pictures, painted with laborious art, and these in turn selected from other thousands; and not ten really great paintings amongst them all, upon quently ignorant of pretty much everything except their "art." They know little of government, little of science, little of industrial life, little of those authors whose work has been most ennobling. An endless number of them know the female figure; an endless number know of the city life of Paris, London and New York. A still greater number have copied the busts and limbs and the groups of Greek art. And as a consequence you have in this Exposition hundreds of paintings that are base, thousands that are copies, and the great majority destitute of an elevating thought



REPRODUCTION OF A STUDIO WITH SIMPLE BUT BEAUTIFUL DECORATIONS.

or of an idea that rises above the commonplace. There are portrait-painters and copyists of nature; but we are almost destitute of great artists.

I should like humbly to submit this advice to the young man studying art: "To really succeed in art you must be able to think great thoughts; you must keep away from what is enervating as you would from a reservation of leprosy. Blood cannot be taken from a vegetable; profound thoughts do not spring from ignorance. Before an artist can paint great ideas, he must be capable of profound analysis. He must lead a broad life, not merely that of the studios. He must take an interest in the politics of his country and in affairs. He should hang these



EXTERIOR MURAL DECORATION OF THE BELGIAN PAVILION—A SERIES OF PANELS DEPICTING CHARACTERISTIC SCENES IN BELGIUM AND COVERING THE FOUR SIDES OF THE BUILDING.

words of Victor Hugo up over his doorway:

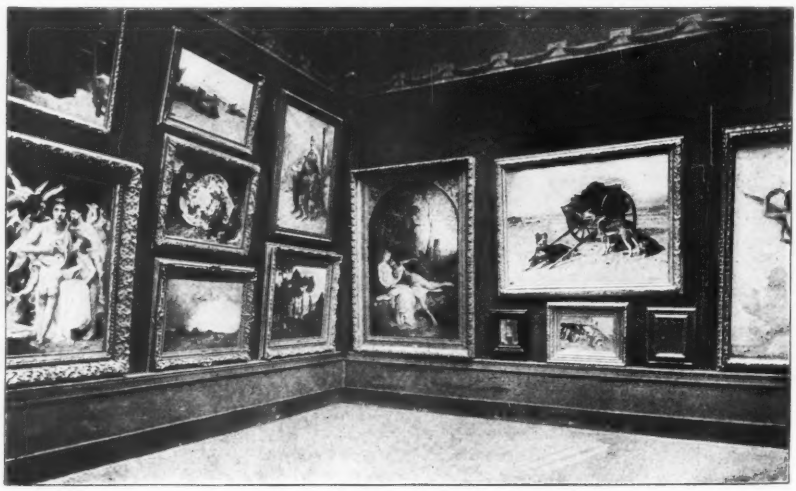
"'FOR THE WORLD LETS EVERYTHING PERISH WHICH IS NOTHING BUT SELFISHNESS:
WHICH DOES NOT REPRESENT AN IDEA OR A BENEFIT FOR THE HUMAN RACE.'"

One admirable feature of the Art Exposition is the division of exhibits by countries. Even numerous South American nations have their representations.

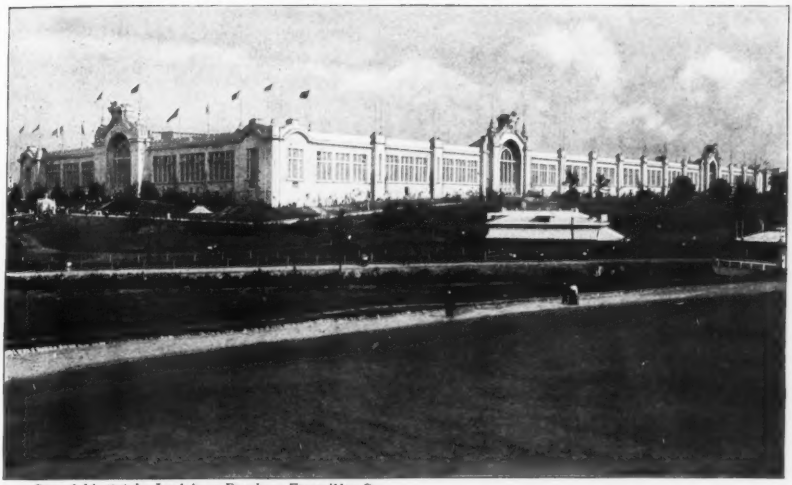
In the Art section, Germany does not lead as in so many other parts of this great Exposition. To our own credit, the United States comes first in the dignity of its work, and also in the amount exhibited. Great Britain comes second, and Japan has the next place of honor. This will be a surprise to many persons. It would have surprised me to find that Japan was even occupying a fourth or fifth place; but this is due to the admirable classification which Mr. Ives, the director of the exhibit, has invented. For the first time in the history of expositions, he has defined art, not under confusing and erroneous definitions, as Fine Art, Industrial Art, et cetera, but under this broad conception:

"He who has worked with conviction and knowledge is deserving in respect in proportion as his work is worthy"—a definition which is a distinct service to the world.

Next to Great Britain and Japan stands Sweden as representing with truth and fidelity the real feeling of her people in art. Sweden takes fourth place because her art represents the free expression of the artists of Sweden, selected for the Exposition through the judgment of her best critics. But in the German exhibit, the very causes which operate to make so magnificent a display in the Varied Industries, in the Educational and other buildings, have had a contrary effect. The hand of the Emperor seems to be over the art exhibit as well as the magnificent displays elsewhere. But here officialdom has not been so successful. In Sweden—making a comparison between the two countries—we have a display which voices the feeling of the whole people for art; while in the German exhibition we have an official expression of art. We have selections by great masters from various public galleries, from the municipal museums ranging over the last twenty-five or thirty years. It stands as a strong exhibition of what official influence has done for art in Germany, but does not give to the visitor the real feeling of the German people for art as it exists in that great country to-day. The independent artist-workers of Germany are conspicuous by their absence. France is distinctly a disappointment to be added to the other disappointments of this great art palace.



A CORNER OF THE ART EXHIBIT.



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THE PALACE OF AGRICULTURE, COVERING TWENTY ACRES—SO LARGE THAT IT LOOKS LIKE A STREAK ON THE HORIZON. IT CANNOT BE ILLUSTRATED TO CONVEY ANY IDEA OF ITS SIZE.

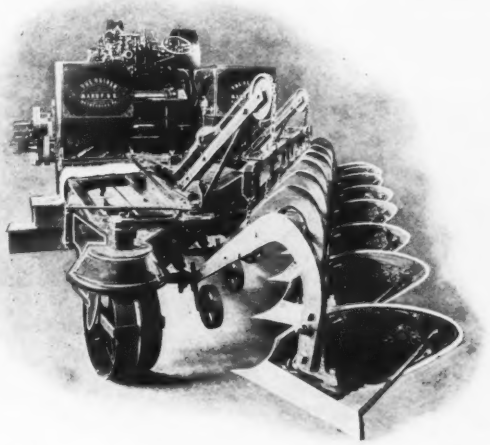
XVI. SCIENTIFIC AGRICULTURE.

By John Brisben Walker.

As our great cities become more congested, as life in their streets becomes subject to stronger competition and vicissitudes, the independence of the man who cultivates the soil stands out each year in stronger contrast.

Living in a tenement-house, subjected to a hundred harassing conditions, his labor dependent upon the whims of employers, his children raised up in badly ventilated sleeping-rooms, his wages consumed by the extra costs which are placed upon the poor, the worker in the great cities, if he but knew, would turn with envy to the man who lives close to the soil. It is not necessary that a family should have a great farm. Those who understand know that as much profit can be taken from a few acres, under high cultivation, as from one hundred and sixty under average care.

The instant a man comes into possession of a few acres he is his own master, and he can do this ordinarily by "buying on time"—starting with the smallest capital. His house, however humble, can be made absolutely sanitary, and the conditions of his life in every way hygienic. If industrious,



AN EIGHT-GANG STEAM-PLOW. CAPACITY FORTY ACRES A DAY IN AVERAGE SOIL.

CANADIAN EXHIBIT—BOOTH MADE OF NATIVE GRAINS TO SYMBOLIZE CANADA AS THE GRANARY OF THE BRITISH EMPIRE.

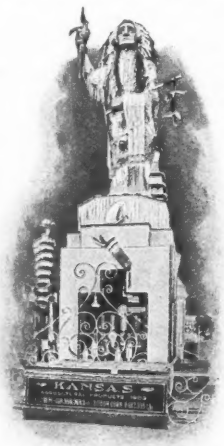
he can always be sure of plenty to eat. His chickens, his pigs, his cow and his vegetable-garden are in themselves a guaranty against want. It is the history of the energetic farmer that each year he lays by something of profit, which furnishes an insurance against old age, instead of finding himself in his latter days unable to pay rent, or perhaps thrown upon the public charity, as too often happens in the great cities.

Therefore, the largest building at the World's Fair is appropriately devoted to Agriculture, and another great building to Horticulture, and a great section of the Education Building set aside for the exhibits of the agricultural colleges.

"Study Science" is the watchword of the farmer of 1904, as shown by the Exposition. Make two grains of corn grow where one grew before, by applying accurate knowledge to the cultivation of the soil. There was a day when the theoretical farmer was looked upon with contempt. Now, every farmer must have a knowledge of the chemistry of the soil if he would prosper. The milkman has become a scientist. His dairy is a laboratory.

To the cotton-planter, the cane-, beet- or corn-grower, the discussion of by-products is of the utmost interest. Where formerly all was thrown away except the fleece of cotton, now there are by-products which almost equal in value the cotton itself. First the discovery that a valuable oil could be pressed from the seed; then that the cake of meal, which was left in the compress, could be used for restoring nitrogen to the soil; then that this compressed cake was an excellent cattle-food. It was found that even the hulls contained a valuable supply of potash; and later on that they could be used for food. The expressed oil was at first used for various purposes, but under the deft manipulation of the chemist, it became a substitute for lard. More experimental work and then we had oil which was palmed off on us for the growth of the olive; and there were refuse substances which were of use in the production of soap.

The by-products of corn, other than those which Kentucky makes most use of, are many—more than six kinds of starch, a number of varieties of sirup, glucose, gum-dextrin, corn-oil, gluten-milk and, finally, imitation rubber.

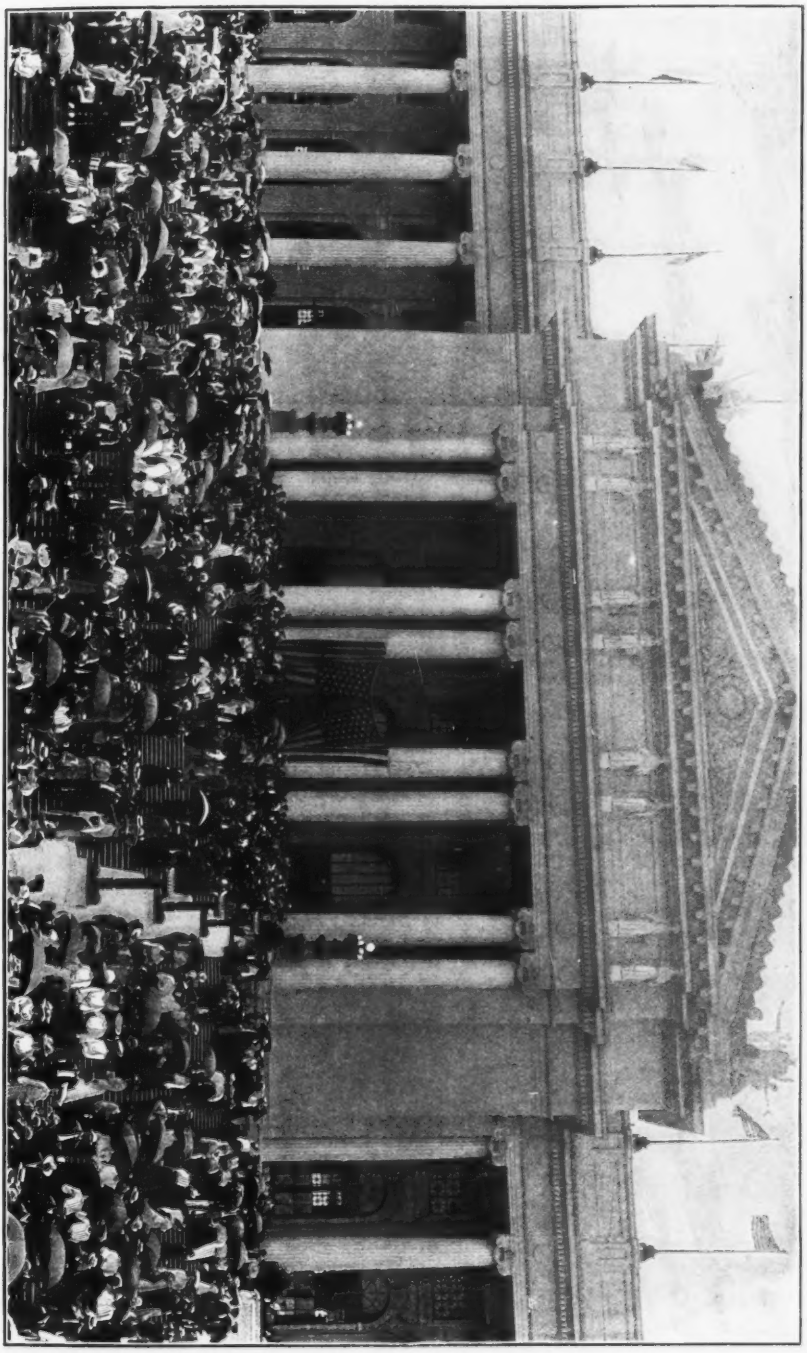


KANSAS AGRICULTURAL EXHIBIT—FIGURE OF CORN AND BROOM-CORN.

From the corn-stalk comes a series of cellulose by-products—the "half-stub," "crude pulp" and "white pulp" for paper.

From the cane and the beet-root are obtained half a dozen varieties of sugar and sirup, and there is refuse which is extensively used for cattle-feed. This is but one phase of what science means to the farmer. On the farm itself he applies the knowledge of the agricultural school in a thousand ways, and secures each time an increase over the methods known to the old-time farmer unfamiliar with the agricultural schools.

Not merely upon the



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OPENING-DAY CROWD ON THE STEPS OF THE UNITED STATES GOVERNMENT BUILDING.

material side has a knowledge of science helped the farmer. It opens up to him a world of things round about. He comprehends in the growing plant and the busy animal life an endless number of interesting facts, which before were mysteries, and which tend to make life interesting and intellectual. Not merely do books become more instructive to him, but as his mind develops there is more and more of interest in his life—more and more tending to elevate himself and his family above the mere drudgery. This tendency is helped by the cheapness of modern books and periodicals. It is a poor sort of farm indeed, to-day, where you do not find a book-table and a half dozen weekly and monthly periodicals. When good roads shall be added to these other advantages, the young men and young women of the farm will find the home the most interesting place.

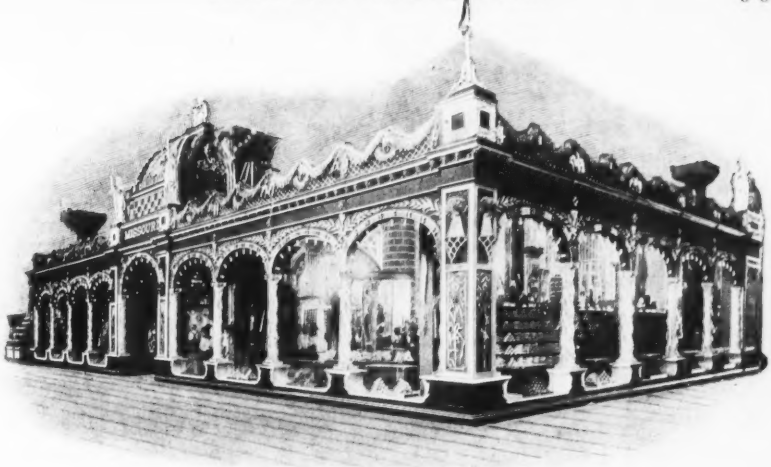
In the Nebraska Agricultural exhibit there is a small hall fitted up with a biograph, which at all times entertains a large gathering in displaying the qualities of Nebraska soil.

EQUESTRIAN STATUE OF FERDINAND DE SOTO, DISCOVERER OF THE MISSISSIPPI RIVER, BY E. C. POTTER, ON THE PLAZA OF ST. LOUIS.

Chapter one of this biograph story opens on a prairie farm. You see the farmer come out of his comfortable home in the early morning, take his team from the stable and proceed to the field. The plow stands ready in the furrow. Two strong horses are attached, and off they go, the veins standing out on their necks, strength in their limbs, spirit in their movement. The rich black soil is turned up in a furrow that is irresistibly convincing to the practised eye. There can be no question whatever about the quality of the soil. Its richness is before your eyes, and I do not believe that there was a single person in that room who did not wish he owned a farm in such a land of natural wealth. But I wish the biograph had also carried one into the sitting-room of that farmhouse in the evening, and had shown around the lamp on the book-table, the family circle, each member with a book or periodical, at the pianola the farmer himself, enjoying his new toy, which enables him to give his family the latest topical songs of the far-off great cities.

The Agriculture Building covers more than twenty acres. There are nine miles of booths. To measure off this building with the eye, is like trying to comprehend the term billion; but some idea of its space may be formed from the fact that there are forty-five exhibits, each of them covering a space as large as the floor of one of the largest New York department stores. Upon the occasion of one of my visits to the building, I heard the sound of a drum-corps approaching from the distance. Presently through one of the aisles came a military company. They were going to a review, which was to be held in a space set aside at one end of the building. They marched past with banners flying and with joyous tramp. Then they disappeared in a neighboring aisle, and the sound of the drums grew fainter, until presently it was lost, and the military were swallowed up in the vastness of the building.

The endeavor in this great exhibit has been to give a complete story of each crop, told in the simplest way, so that any one interested can find his materials and have his questions answered with the least possible effort. This is shown with tobacco, cotton, corn, sugar-beets, sugar-cane and rice. Not only are processes shown, but in each of these there are brought together examples of all the different methods of



AGRICULTURAL EXHIBIT OF THE STATE OF MISSOURI.

grading for the various markets to which they go—first the varieties, then the grades.

In tobacco all the processes are shown, including a model curing-barn, in which the tobacco is sweated and cured. Then the various gradings for different parts of the world. Some of these are the special products of special sections. For instance, Clarksville has the specialty of a very heavy black tobacco, which it exports to Italy.

One state alone, Kentucky, produces three hundred and fifty million pounds of tobacco annually. North Carolina follows with one hundred and twenty-eight million

PART OF EXHIBIT OF NEBRASKA'S STAPLE PRODUCTS—A NOTABLY ARTISTIC USE OF SUCH MATERIAL.

AN ASCENT IN THE PILOT BALLOON.

pounds, and Virginia with one hundred and twenty millions of poison—nearly all of this consumed by men whose physical condition is wrecked by its use, and to whom its purchase is an extravagance and a deprivation of their families.

Some striking statements occur in the Agricultural exhibit. Here is a large sign in the Illinois section:—

"Illinois Produces 284,000,000 Bushels of Corn Annually.
"Illinois Consumes 216,000,000 Bushels of Corn Annually."

Which does not mean that the Illinois people eat all of their corn crop except sixty-eight million bushels; but that Illinois farmers prefer to convert their own corn crop into pork, and also a very large part of this pork crop into preserved meats.

In the Wisconsin exhibit one sees this inscription, speaking of cheese:—

"18,000 Factories, 60,000,000 Pounds, 3,000 Cars, 100 Trains."

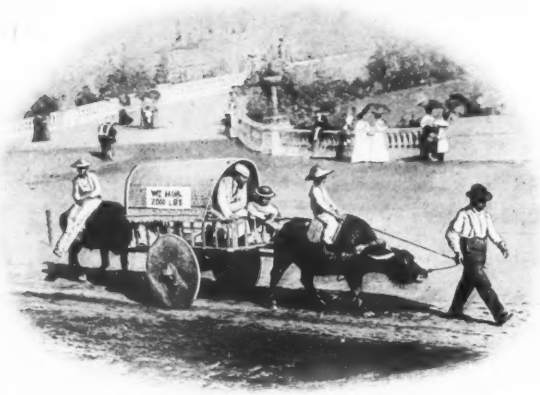
Scientifically constructed machinery is coming into use in every department of farm labor. There is a manure-spreader, for instance, costing about double the price of a good wagon. At the rear of a wagon-bed is a revolving wheel with iron teeth, which catches the manure, whirls it in the air and throws it out with an almost perfect regularity of distribution, spreading the load in about one-quarter the time that a man could do it with a fork, thus more than doubling the work which a wagon, two horses and a man could do under the old method of hand-spreading.

Not only is the work of the human arm being dispensed with in the distribution of manure, but also when it comes to the loading up of hay. A trailer is hooked on to the rear of the hay-rack. A belt of cross-bars and cords reaches from the bottom to the top. A cylinder with iron teeth moving within an inch or two of the ground catches up the loose hay, throws it on the belt, and so the hay moves in a steady stream up into the wagon. This takes the place of three men, besides doubling the work which the horses and wagon can do.

Not only is the hay carried up into the wagon in these modern days by machinery, but when it arrives in the barn, an overhead railway (put up at an expense of twenty cents a foot, with five dollars more for a modern carrier) picks up the hay

WINE-TUN WITH A BEAUTIFULLY DECORATED HEAD, IN THE FRENCH EXHIBIT.

THE SUNKEN GARDENS FROM THE STEPS OF THE UNITED STATES GOVERNMENT BUILDING. ON THE LEFT THE PALACE OF MINES AND METALLURGY AND THE PALACE OF EDUCATION AND SOCIAL ECONOMY; ON THE RIGHT THE PALACE OF LIBERAL ARTS AND THE PALACE OF MANUFACTURES.



AN ASIATIC METHOD OF TRANSPORTATION THAT HAS REMAINED UNCHANGED FOR A THOUSAND YEARS.

from the load and transports it to that part of the mow in which it is desired to deposit it. The Exposition shows that in agriculture, as in every other department of human effort, the ingenuity of the mechanic is being brought in to double, triple and even quadruple the effort of man.

Planting, too, has long since become a thing of science. The farmer rides his chariot through the field, and pushes the button—in this case it is a lever—when ready to begin dropping seed, and the machine does the rest with absolute regularity, and without waste, reaching just the right depth.

Modern farming in its latest development is illustrated by the automobile plow, whose driving-wheels have a tread of thirty-nine inches. Eight great plows are hung on a solid framework behind, and an engine with two men, one to look after the plows and one in charge of the engine, will do the work of eight men and thirty-two horses. The price, however, of these plows ranges from twenty-two hundred to four thousand dollars, and it is much easier for the farmer to calculate the saving on a plow of this description than it is to raise the money to buy it. The capacity of the eight-share gang-plow is forty acres a day in average soil. The first one of its kind was sold to Johannesburg, South Africa.

Not even in clearing fields can the farmer afford to spend a day or two days digging around a stump. In these times he buys, for from one hundred to two hundred dollars, depending upon the size of the stumps to be pulled, a machine which is taken out into the field and fastened with wire rope to adjoining trees. A cable, which has a radius of one hundred feet, is next carried to the stump which is most convenient within that distance. Two horses at the end of a sweep now begin to move around a capstan. The wire cable tightens—tightens a little more—and up comes the stump entirely, as neatly as a dentist takes out a tooth. There has been no grubbing of roots, no preliminary work with the stump. It comes out entire. The cable is then attached to an adjoining stump and the operation repeated, until the field is cleared.

One of the developments since the Chicago Fair has been the introduction of "power" on the farm. It has taken various forms. One of these is the hot-air pumping-engine, which is operated by building a fire under the engine. This fire can be made of wood, coal, gas, gasoline or kerosene. These engines are principally for pumping water, are almost absolutely automatic, and come in prices ranging from one hundred to five hundred dollars.

Another form of power for farmers is the gas-engine, which is an explosive engine and is obtained in almost any horse-power, at prices ranging from seventy-five dollars up. This requires rather more attention than the hot-air engine, but is practically automatic.

The windmill, ancient as the hills, has taken on many new forms; and the ram, which is likewise an ancient institution, continues in popularity with a slightly increased efficiency for use where the "head" of water is such as to justify waste. The storage battery will soon be an adjunct to the farm. Power used, whether hot-air engine, or gasoline, or windmill, can, by the aid of the storage battery, be accumulated at times when the machinery is

not otherwise required, and the accumulations used at night in electric lighting for the house, giving the farmer the advantages of the city in respect to lighting.

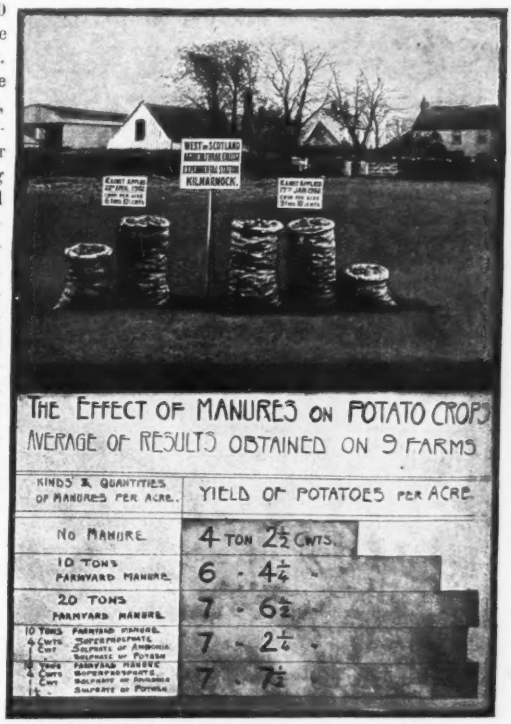
At the time of the Chicago Exposition, the windmill was already well worked out, but its usefulness was only imperfectly understood. To-day, every farmer who can afford the expense is putting in a mill, recognizing that in the wind which blows he has an asset of value which must be made use of. First and foremost among its tasks is the pumping of water, especially on prairie lands where there is no spring on the hillside. Next to that are the grinding of feed, shelling of corn, sawing of wood, cutting of fodder, running of milk-separators, churning of butter, et cetera. In some parts of Kansas where the water is near the surface, a large mill can be made to pump a supply of water that is valuable for garden purposes.

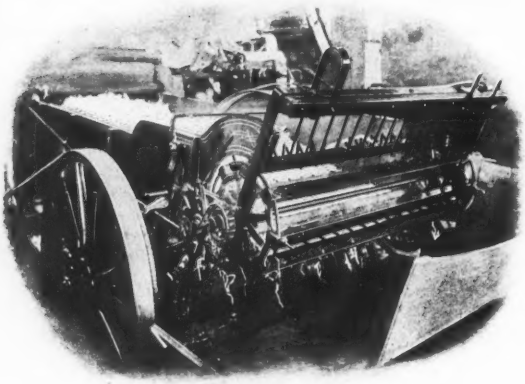
A sixteen-inch windmill, costing from one hundred and fifty dollars to two hundred and fifty dollars, will lift 78,960 gallons per hour a distance of five feet. That gives 2,632 barrels. It will lift 144 barrels a distance of one hundred feet; that is, 3,427 gallons per hour in a fifteen-mile wind, the pressure per square foot of area and sail being estimated at one pound. It would be entirely possible, also, to operate two of these mills in conjunction to generate electricity, which could be stored in a battery and used for lighting purposes at night. I was surprised to learn, however, that no manufacturer has put on the market a small, compact dynamo and storage battery to be used in connection with windmill work. Near the Agriculture Building there is a perfect forest of mills, rising up one hundred feet high, built of steel, apparently of such light construction that a good wind would carry them away; but when one comes to examine them, they are found to be braced with steel-twisted wire and form as perfect a piece of work as would satisfy a bridge engineer.

A hundred-foot steel tower, wire-braced, with a sixteen-foot mill, costs, erected, about two hundred and fifty dollars. A ten-foot mill, however, answers every purpose of the average farmer. This mill on a hundred-foot tower would cost one hundred and seventy-five dollars, erected and running.

The rapidity with which this asset of the farmer is being realized upon is demonstrated by the statement of those in the business to the effect that there are sold each year between one hundred thousand and two hundred thousand windmills. In the state of Indiana alone there are twenty-five factories devoted to the manufacture of windmills, one town having four of these; and in the whole country there are probably three or four hundred firms engaged in the manufacture of windmill machinery.

In connection with milk, there is much of interest for the city woman as well as for her sister of the farm.


WEST of SCOTLAND
AGRICULTURAL COLLEGE
EXPERIMENTAL STATION
KILMARNOCK.
THE EFFECT OF MANURES ON POTATO CROPS
AVERAGE OF RESULTS OBTAINED ON 9 FARMS
KINDS & QUANTITIES OF MANURES PER ACRE.
YIELD OF POTATOES PER ACRE
No MANURE.
4 TON 2½ CWTS.
10 TONS FARMYARD MANURE.
6 - 4¼ -
20 TONS FARMYARD MANURE.
7 - 6½ -
10 TONS FARMYARD MANURE. 4 CWTS. SUPERPHOSPHATE. 1 CWT. SULPHATE OF AMMONIA
7 - 2¼ -
10 TONS FARMYARD MANURE 4 CWTS SUPERPHOSPHATE. 1 CWT SULPHATE OF POTASH
7 - 7½ -



AUTOMATIC MANURE-SPREADER—ONE OF THE MOST IMPORTANT OF THE TIME- AND LABOR-SAVING IMPLEMENTS EXHIBITED IN THE PALACE OF AGRICULTURE.

Passing through the exhibit of Agricultural Colleges, attention was called by the Chief of the Department to the Babcock Milk Tester. I hesitated, thinking that perhaps it was a patented process and that it meant some apparatus seeking advertisement. But being interested in the subject, I went along and watched the operation. Then I learned that this valuable test, ingenious, scientific and perfect, was the work of an American scientist, a chemist of the Wisconsin Experiment Station, Dr. S. M. Babcock, and that he had given to the world the results of his study and ingenuity without patent and without reward. His name certainly deserves to rank among the most notable in the annals of invention.

The operation relates to the determination of the value of milk for city use. How important this is, the immense mortality among infants in cities like New York and St. Louis, where the ordinance regarding the milk-test is not in full force, tells the tale. Not only is there danger from impure water being added to the milk, but from the skimping of the child's food through its receiving less than the mother supposes it is getting, owing to the fact that a considerable portion of what should be milk is water. Mr. Dewhirst, in charge of these experiments, stated that he had found milk in St. Louis to be half water.

The first operation in the determination of pure milk consists in carefully measuring a little over half an ounce of milk in a graduated bottle. Into this is poured a like amount of ordinary commercial sulphuric acid. It must be poured with care, however, for it means burned fingers if any of it should go over the bottle.

Then the milk-test glass, which is simply a bottle with a long stem, is well shaken until the milk and the sulphuric acid seem to have united into one dark liquid. The sulphuric acid dissolves everything except the butter-fats. The fats are now separated from the acid solution by being rapidly whirled. Any small centrifugal machine will do for this purpose. One can be bought with bottles and a supply of acid, all complete, suitable for household use, for about four dollars.

This system has gone into use in practically all the creameries of the country. There a farmer bringing in his milk has it measured, not as milk, but as "butter-fat." He is paid so much a pound for butter-fat—that is, for the cream richness of his milk. There can be no object for him, therefore, to increase its bulk by adding water.

To proceed with the test: At the end of the five minutes the fat is gathered as a yellowish oil on top of the acid. Adding hot water, the oil rises to the top of the water and stands in the narrow neck of the bottle. Upon this is a graduated scale, and the amount of butter-fat per seventeen centimeters of milk is now determined.

In the test which I witnessed, the oil stood in the neck at the .6 mark, while the bottom of the butter-fat stood at 1.8. The 1.2 of fat obtained was equal to about three-tenths of a pound of butter per gallon—very good milk.

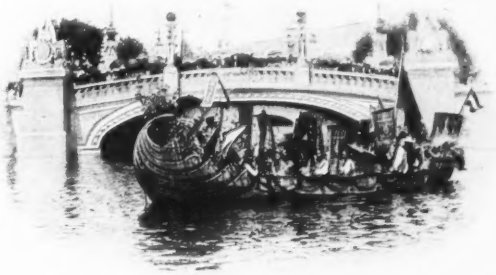
It is a pity that every housewife visiting the Exposition should not see this exhibit, because it would bring the milk problem home to her in a very simple way that almost any amount of reading could not equal.

The lactometer test for milk is even simpler, but does not detect the removal of the cream. It will, however, show

if the milk has been watered. In a test-tube is placed about a pint of milk. The lactometer, which can be bought for about forty cents, is placed in the milk, and the percentage of water in the milk determined by the depth to which the lactometer sinks. If it falls below 29, there is water; above 29, pure milk. In proportion as it sinks deeper than 29, so the amount of water is indicated.

But the essential of good milk is that the butter-fat has not been removed in the cream, and the lactometer does not detect this fraud. One of the most common forms of graft, and one of the meanest, is adulteration of milk in a great city, and too many people cannot be taught this lesson of detecting adulteration, if we are to reach a time when adulterated milk will have become a thing of the past.

Too much stress cannot be laid on the milk question for the average family. When we come to the agricultural exhibit, we find there two machines which are playing an important part. One is for sterilization, with a view to killing the germs. This is done by heating the milk to about 200° Fahrenheit, which is sufficient to kill the germs. The effect of this on the milk is sometimes to give it a burnt taste. The famous Frenchman Pasteur invented a process which is mechanical, and which is now very generally used. This consists of heating the milk to 160° Fahrenheit. Then it is placed in a closed circular bath in which are a number of disks which revolve in this circular trough. Into these disks, steam is admitted through a trunnion. The disks, revolving rapidly, heat the milk and "pasteurize" it.



CHINESE BOAT DECORATED FOR TRANSPORTATION DAY.

There are interesting machines for the separation of cream from milk. One separator consists of a bowl connected with a rotating apparatus turned by hand. A very little exertion of the handle brings this bowl into revolution at the rate of seven thousand turns per minute—a number almost inconceivable to the average mind, and, indeed, to the scientific mind. This machine operates on a very simple principle. There are in cream two ingredients, one fat, the other, milk. These have different specific gravities—that is, one is heavier than the other. As soon as this tremendous rotary motion is under way, there is a tendency for the heavier body to fall to the outside, or periphery, of the bowl—the lighter body remaining at the center. In the interior there are disks that act in a manner very similar to the old-fashioned skimmer on the pan. They catch the particles of butter-fat, directing them toward the center, and toward the top of the bowl, from which they emerge, and are removed. This separator can be regulated to skim any density of cream. The cost of these machines goes as low as sixty-five dollars—quite within the reach of the average farmer, and, indeed, within the reach of the family that keeps a few cows.

One marked advance in agriculture—or horticulture, if you choose to subdivide—is in the preservation of fruits. Perhaps the world has not progressed so much as we think. In Pompeii, one finds the glass jar with the fruit preserved as at the time of the eruption; yet glass jars came into existence in America only some thirty or forty years ago. So now we are perhaps only relearning the ancient arts that have been forgotten.

At Chicago there were in cold storage perhaps not more than five hundred barrels of apples of the previous year's crop. This was due to the difficulties of preservation. At this Exposition we find in the Horticultural Building thirty carloads of apples of the crop of 1903. In other

words, the art of preservation has been so perfected that any one may practise it, and the cost is comparatively little. The process means nothing more than that the apples are kept at, or just below, freezing. With the modern ice-making machine and the gasoline engine, it is possible for the farmer to do this in his own way with the underground cellar; but still simpler is the method of shipping to the large cold-storage houses which now dot every part of the country.

There are a few plants which are revolutionizing agriculture in some of the Western states. One of these is alfalfa. It was sent from Spain to Peru; from Peru it came to California; from California it was introduced into Utah. I had the honor to be the first farmer to introduce this crop on any scale of cultivation into Colorado, and at one time harvested three thousand tons a year. I once traveled with a party of Mormon bishops who had met the president of the Denver & Rio Grande Western Railway in his private car. I asked one of them, "What was the religion which Brigham Young preached?"

To which he replied, "His doctrine was something like this: plow deep and sow alfalfa."

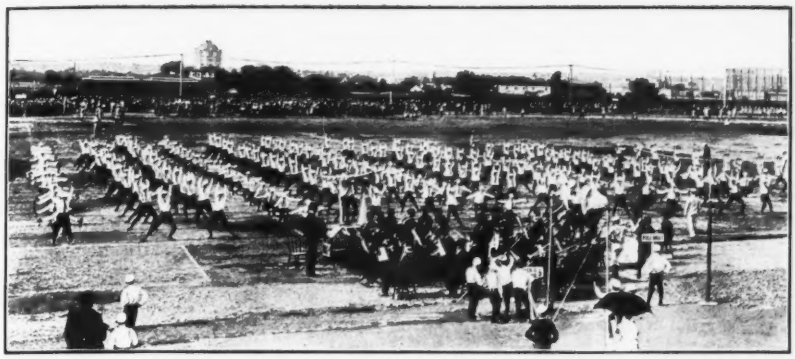
This crop later on was carried eastwardly toward Kansas and the Southern states. It is exhibited in the Exposition in the form of bales of perfectly fresh, green-colored fodder; and in some places its roots, which grow to be from thirty to forty feet in length, with a thousand ramifications of rootlets, give an idea of the depth of soil from which it draws nourishment.

A marked change since Chicago is to be found in the working up from crude outlines of a thousand forms of domestic and other apparatus. Nowhere is this more distinct than in the dairy exhibit. The exhibit in one department of dairy utensils and machinery is almost beyond comprehension to the inexpert. More than fifty kinds of apparatus are shown—possibly a hundred—all of them embodying an amount of ingenuity that is not easily estimated. Farm churns, which carry four hundred gallons of milk, are circular, and operate by machinery. This classification runs all the way through to a revolving bottle-washer. More than two hundred bottles are placed in individual receptacles on the periphery of a wheel. The lower half of this wheel is immersed in hot water, where the bottles are being soaked. Two operators stand at the right of the machine, where a bristle brush just fitting the interior of the bottle is revolving at a high rapidity. Seizing a bottle from the wheel, the operator pushes it over the brush, and in a moment it has been scoured thoroughly. Then the bottle is placed, with the opening down, in a rack, which is gradually pushed around by hand over a spraying-machine, where each bottle receives a thorough cleansing with water thrown out of nipples at high pressure. Two men do on this machine, thoroughly and scientifically, the work of ten under old-fashioned conditions. Thus is labor being saved and the world coming to a basis where it will some day need to work no more than four hours a day.

At Chicago the box churn was the highest development of the art. Here we have a churn holding one thousand gallons, which represents eight hundred pounds of butter. One thousand gallons of cream are placed in this churn. Four corrugated wooden rolls occupy the interior. Under the rapid revolution which takes place, the cream is churned into butter. Then the buttermilk is drawn off, and the churn continues to revolve. The corrugated rolls now take the part of butter-workers, and this mechanical portion of the operations is so perfect that the best hand-work cannot excel it.

One of the rapid advances since Chicago is the introduction of refrigerating machinery. Many thousands of minds have been concentrated on this problem during these eleven years since 1893. As a consequence, they have brought refrigerating apparatus down so that ice may be produced at a minimum cost on a large scale, and for an ocean steamship or a dairy, or even a household.

But space prevents more than a brief outline, and that of but a few of the salient points of these exhibits. Each visitor interested in agriculture and horticulture will find an endless number of points for study pertaining to those subjects which are to him most vital.



MODERN ATHLETICS FOR THE DEVELOPMENT OF WEAK STUDENTS AS WELL AS ROBUST. GERMAN TURNERS IN THE STADIUM OF THE WORLD'S FAIR.

XVII. ATHLETICS AND HEALTH.

THE DEPARTMENT OF PHYSICAL CULTURE.

By John Brisben Walker.

THE difference between the year 1893 at Chicago and 1904 at St. Louis is perhaps more marked in the Department of Physical Culture than anywhere else. At the time of the Chicago World's Fair, physical culture was confined largely to the universities and colleges. Then the hysterical movement in college physical competition was at its height. Its methods could not be explained upon any reasonable ground, and even very able and otherwise honest college presidents lent themselves to the fraud of advertising their colleges through athletic games.

The preparations at St. Louis in the Physical Culture exhibit are on a greater scale than ever before, but the central idea running through the work is no longer the university; it is the public schools. The thought lying at the bottom of it all is how to take the public-school child and convert both him and her into strong-bodied, sane-minded citizens.

I recollect going, some years ago, with President Eliot through Harvard University, and finding but two hundred and twenty-five students in the gymnasium during the hour of the day at which was the chief attendance. Outside were more than twenty-five hundred of the least athletic students—those, consequently, who needed most the attention of the gymnasium. Not being athletes, the college had but little care for their bodies.

But in the public schools of 1904, the idea is not of competition, of hurrah and brag and display and school advertisement, but of truly bringing the child to an understanding of its body and advancing it in that physical training which will give it, not skill in games, but a permanent stock of health and efficiency.

An advantage of the exhibits made is that some ten thousand teachers, coming from all parts of the United States, will be able to observe the work which the schools of the great cities are already engaged upon, and will be, first, instructed, and secondly, incited to emulation.

A large gymnasium, equipped with all that is most modern in apparatus for exercising the body, is part of the St. Louis exhibit. The track for exhibition purposes is the largest and one of the best-constructed in the United States, and has its splendid amphitheater built permanently into the hillside. It is a satisfaction to think that after the close of the Fair this fine property will become the campus of the St. Louis University, and that no dollar of the present expenditure will be wasted.

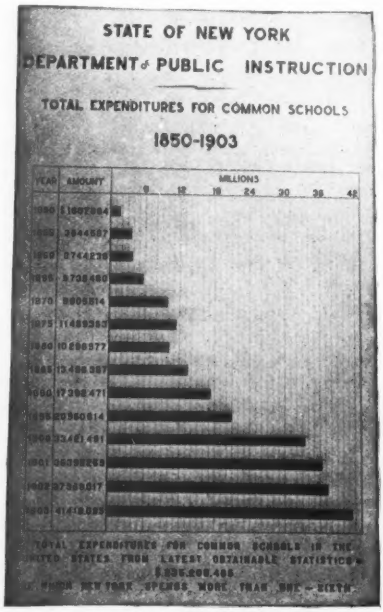
Each day during the Fair has its athletic events—those taken part in by the public-school children sent from many cities being not the least instructive. But the most lasting lesson taught in the Department of Physical Culture is found in the collection of photographs on the walls of the gymnasium building. It is to be hoped that

teachers from all parts of the country will make a point of visiting these, in which is illustrated the best practice of the most modern public schools.

One gets an idea from these photographs of the possibilities of public-school instruction in the way of "setting up" the body of the young boy or girl hitherto but feebly developed. The lesson has been learned from Germany and Switzerland that what is needed is not violent competition for the few, but constant, steady development for all, and that even a class-room may make a fair gymnasium if there is no better obtainable.

Stress is laid upon what may be done in a simple way: the work which may be performed without apparatus, or with only a few inexpensive sticks and ropes.

A new practice, counting much for the health of public-school students, is the interruption of studies at periods during the day for "Two-minute Exercises." The body of the child has grown tired at its desk; the lungs are compressed and are not getting their full requirement of air. In the old days, the student would naturally "loll" and be reproved therefor. Modern scientific instruction takes note of these conditions and provides a hygienic remedy. At a signal, the class drops its text-books, rises on its feet, stretches its arms in a way to expand the lungs, and goes through a few health-giving exercises —time consumed, two minutes. Then it goes back to study, the fatigue from constrained position removed, and the brain freshened by the action of the lungs, and the aerated, freshened blood pumped up by the heart.



A TELLING LESSON IN THE PROGRESS OF EDUCATION.

As into everything else in 1904, reason is being injected into physical training. "It is the custom," is no longer sufficient to explain idiotic methods. Students themselves ask for the why and the wherefore, and get their answers from the health periodicals in such a way that old-fogy schoolmasters often expose themselves to ridicule.

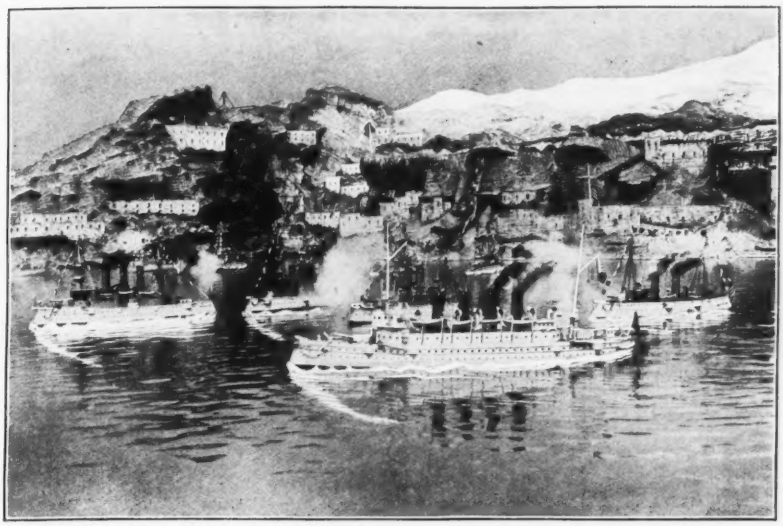
And there are even some university presidents who begin to feel a little sheepish that they tolerate exaggerated sports, under the plea of "advertising the college"; instead of showing the force required to establish college athletics upon the basis of helping all—and, most of all, the weak-bodied—to a thorough development of the body's possibilities — to securing as far as may be for each student a sound mind in a sound body.

Even more notable than the exhibit made in the Department of "Physical Culture" at the World's Fair, is that made in the German section of "Hygiene." I have quoted at length in another article the noble position taken by the German State on the question of preserving the health of its people.

I will close this article here by one extract which is of such great importance that it will bear repetition, because it is laid down as a fundamental principle of government.

"*The maintenance of the health of the individual is the chief requirement of the healthy growth of the state.*

"All progress in the direction of health is synonymous with economic gain. On the other hand, health is the source of the nation's ability to defend itself."



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THE NAVAL BATTLE OF SANTIAGO—THE AMERICAN SHIPS ATTACKING THE SPANISH FLEET AS IT LEAVES THE HARBOR.

XVIII. THE NAVAL BATTLE OF SANTIAGO

WITH REAL SHIPS AND REAL GUNS FIGHTING ON REAL WATER.

By John Brisben Walker.

IN the olden days, men went to war for excitement. In the twentieth century, men go to see the excellent imitations of warfare which are gotten up on a fifty-cent admission. This is even more exciting than the real thing, and has the advantage that the wives and sweethearts can be present during the most terrific part of the combat.

An amphitheater is built one-third of the way around a large sheet of water. Opposite the tiers of seats are fortifications and the entrance to the harbor of Santiago. Presumably out in the bay, but really immediately beneath the grand-stand, float duplicates of the United States battle-ships, cruisers and torpedo-boats which blockaded Santiago's entrance.

These are not toys, but real ships in miniature, constructed of steel, with ports and guns and turrets and lights and signals exactly as on the larger fleet. Within their hulls is stored the electric power which drives their propellers. Within each sits a trained man who applies the power, steers the vessel, fires the guns and runs up the signal flags. The battle-ships are twenty-one feet in length; the torpedo-boats in proportion. Floating idly at anchor under the moonlit sky, with lights gleaming from portholes, the vraisemblance is perfect enough to let the imagination of the onlooking audience almost hesitate as to the reality.

Suddenly the Spanish fleet is seen creeping out from behind the headlands. The alert torpedo-boats rush as did their prototypes at the real Santiago. A great gun from the turret of the "Texas" booms out upon the night air. Then there is a flash from the "Iowa," and another from the "Indiana," and two from the "Massachusetts." The Spanish boats reply. The forts on the hill begin a quick fire from their batteries.

Then all the ships take part. Their movement is swift. They circle the water under sure guidance. Amidst the roar of a hundred guns, a shell strikes a magazine in one of the enemy's cruisers and there is an explosion; not a dull roar, but a real, live explosion which sends the fragments of this vessel a hundred feet in the air.

Of course, it was a dummy—not one of those in which men are concealed—but in the heat of conflict the spectator overlooks this fact. Another of the enemy's ships is beached, and slowly sinks by the stern. A well-planted shot strikes a magazine in one of the forts on the heights above, and again there is an explosion which rends the papier-mâché rocks into fragments.

During one part of this conflict, a mine of Greek fire spouts up to a height of fifty feet or more. Balls of flame appear on the surface of the water, and rolling rapidly toward the men-of-war, surround them. As these battle-ships are propelled rapidly through these flames, you wonder how the men on board escape at least extreme discomfort.

How infinitely this eclipses those old contests of Astley's Circus, told of in the "Bon Gaultier Ballads," when

> "Courses three around this circus,
> Gomerzales, thou shalt run
> Ere yon seething pasteboard ocean
> Shall receive yon canvas sun."

Modern art, but especially modern machinery, has given us modern amusements which are so real as to almost confuse the mind—certainly permitting us for the moment to forget the stern realities of life with which we are, all of us, contending, and give ourselves up fully to the enjoyment of scenic effects—and it is this result we seek.

ENTRANCE TO THE EXHIBIT OF THE DIFFERENT FORMS OF WORKINGMEN'S INSURANCE ISSUED IN THE GERMAN EMPIRE.

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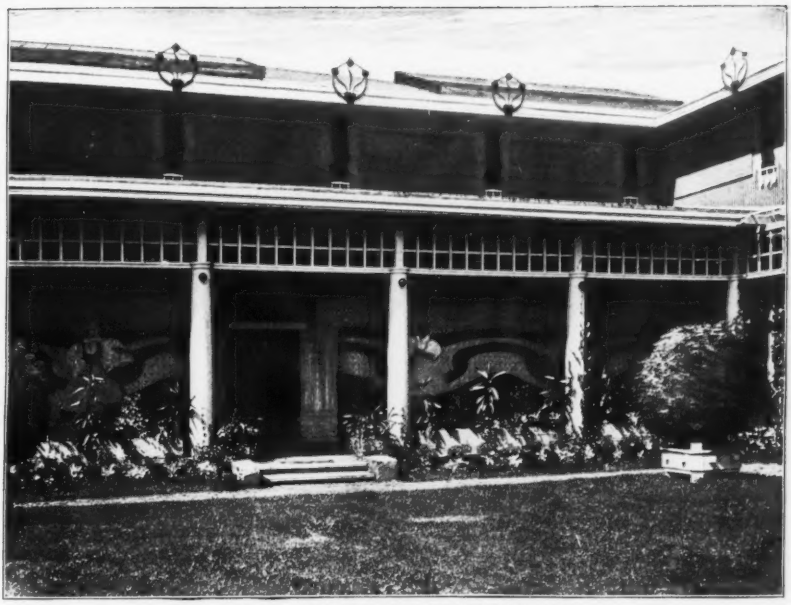
THE NAVAL BATTLE OF SANTIAGO—THE BLOWING UP OF ONE OF THE SPANISH CRUISERS.



IN THE GARDEN OF THE AUSTRIAN PAVILION.

XIX. FOREIGN NATIONS AT THE FAIR.

WHAT THEY ARE TEACHING THE PEOPLE OF THE UNITED STATES.

By John Brisben Walker.

FIRST surprise; then profound astonishment; then mortification: this describes the feelings which developed as I made my progress through the Exposition, everywhere Germany and Japan displaying a superiority for which, I confess, I was in no way prepared.

This heterogeneous collection of crude agricultural peoples which has been brought together but so short a time under the name of Germany! This other half-civilized people, through whose capital I had ridden accompanied by a guard of cavalry to protect the foreigner, only thirty-six years ago—about the time the first telegraph instruments were being introduced—this island of the Pacific which knew nothing except tea and porcelain less than half a century ago! These are the nations which are to-day leading the world.

Ninety-two per cent. of all the Japanese children are to-day in attendance in the schools under a compulsory education law. More than ninety-four per cent. of all the children of Germany are in attendance upon the public schools, likewise under a compulsory law. Thirty-seven thousand German students were in the universities in 1903. Nearly all of this education directed toward the acquisition of practical and scientific information!

In Japan the Department of Education is a full ministry. In the United States the Department of Education is a petty bureau.

And we of the United States, with forty per cent. of illiterates in some states, and spending only fifty-eight cents per capita per annum on education in other states, are vainly imagining that we are going to continue to be the world's greatest people! We must wake up speedily.

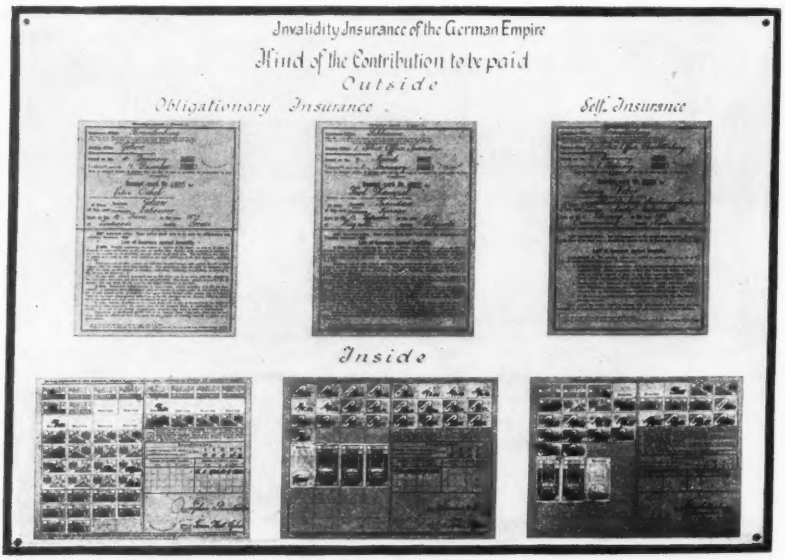
In 1868, after dining at the American Legation, then at Yokohama, I went off to my steamer in a sampan with Lieut.-Commander Brown, who had brought out to Japan the "Stonewall," sold by the United States Navy Department. She was, I believe, the first steamer bought by the Japanese. To-day in the Japanese exhibit we learn that Japan has a single steamship company which owns eighty vessels, having nearly

three hundred thousand tons of carrying capacity, and that the various Japanese lines operate nearly one thousand steam-vessels. All their latest and largest ships are built in Japan.

In another exhibit, Japan shows the progress made in its postal affairs. It starts off with no private competition. Parcels are carried to all parts of the empire at a nominal price, in comparison with the same service in the United States. As a consequence, the circulating library is everywhere carrying instruction to the people of Japan. We know by experience that in the United States very few persons ever thirty-two cents for sending a four-pound book ten miles—a blow of the most serious character against the development of the national intelligence.

Japan makes no such discrimination. Every facility is given for the circulation of the best literature. Not only this, but her Postal Department encourages her people to habits of thrift by selling at every post-office stamps which may be pasted in a book, and which, in this simple way, constitute evidence of the government's indebtedness for the savings deposited.

Germany, which but a few years ago



TRANSLATION OF SAMPLES OF RECEIPT-CARDS ISSUED IN GERMANY TO WAGE-EARNING PERSONS, INSURING THEM AGAINST LOSS OF WAGES THROUGH ILLNESS OR MILITARY SERVICE. THE HOLDING OF THESE CARDS MAY BE MADE OBLIGATORY BY EMPLOYERS, OR, IN THE CASE OF HIGHER WAGE-EARNERS, SELF-OBTAINED. PREMIUMS ARE PAID BY MEANS OF STAMPS PASTED WEEKLY ON CARD DURING PERIOD OF EMPLOYMENT.

go to libraries. In Japan the government carries the libraries into the homes of the people. Private enterprise has demonstrated that men and women are eager to have books sent to them upon the payment of a fair rental charge per annum, the family thus securing a great variety of books at a comparatively small outlay. Yet more than half the people of the United States are cut off from this source of education by a Post-Office which charges

began ship-building, presents accomplishments in great ocean liners which equal England's best work. Throughout almost every department the same story of superiority is told, and not only in the practical, but in the beautiful. The German exhibit, as a whole, is the most superb that has ever been made at any exposition.

Again, we have both Germany and Japan teaching us lessons in household decoration. No housewife should omit

PEASANT PIPERS AND DANCERS IN THE IRISH VILLAGE.

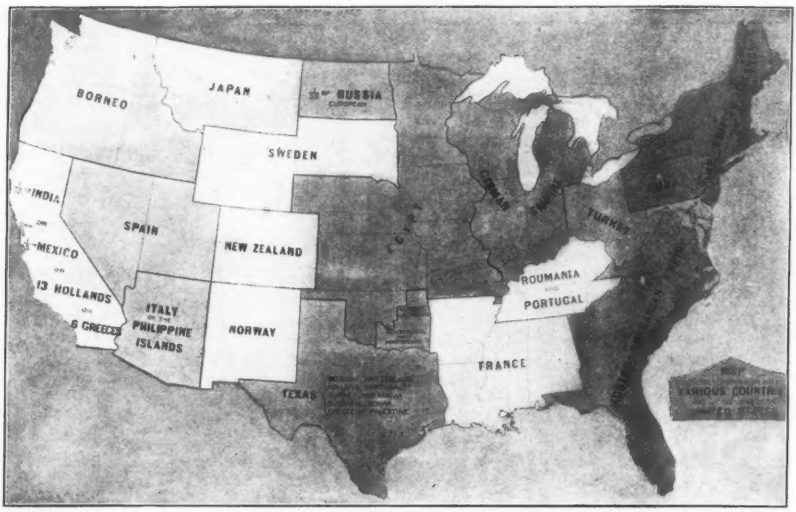
seeing the German exhibits and the beautiful Japanese living-rooms which are shown at the Exposition in the Varied Industries Building. Simplicity and perfect taste mark them in every detail. No stuffing of rooms with crudely designed and unnecessary furniture! The Japanese have learned the art of preserving health. They do it by deep breathing, by bathing, by exercise, and—above all, this is the chief lesson to be derived from their sleeping-room construction—by breathing fresh air at night.

Nearly every nation represented at the Fair has its lesson for the American. Perhaps in Belgium we find more than in any other.

If the industrial exhibit of England shows her strength in the past, there are not a few things in the Exposition of 1904 which indicate weakness in the present. Mention has already been made of the feeble exhibit of educational work by Great Britain. In the Liberal Arts Building we find a great room forty feet square devoted entirely to excellent photographic reproductions of official and historic ceremonies and costumes. Yesterday, a New York paper gave up a half page to illustrating the change of style in King Edward's hat, and the announcement that his trousers were creased in four places. The two taken in connection are suggestive, but not of the highest order of intellectual development. Both England and the United States must wake up.

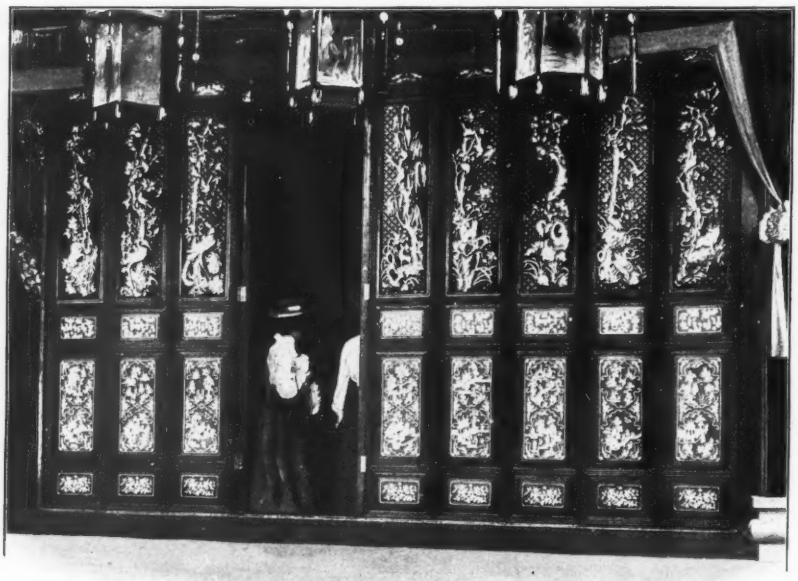
AN ARTISTICALLY ARRANGED COMMERCIAL EXHIBIT FROM JAPAN.

Congress should have made an appropriation requiring the appointment by President Roosevelt of a commission to this greatest World's Fair to report on its lessons in government and in industry. When the great permanent exposition



NEW YORK STATE EXHIBIT—MAP TEACHING AT ONE GLANCE OF THE EYE THE RELATIVE SIZES OF FOREIGN COUNTRIES BY REFERRING THEIR AREAS TO THOSE OF THE STATES OF THE UNION.

opens in New York upon the three-hundredth anniversary of the arrival of Hendrik Hudson, as I hope it will, the important national duty should not be overlooked of communicating to the public mind the lessons taught.



SCREEN WITH BEAUTIFULLY CARVED PANELS, IN THE CHINESE PAVILION.

XX. EXHIBIT OF MODERN ROAD-BUILDING.

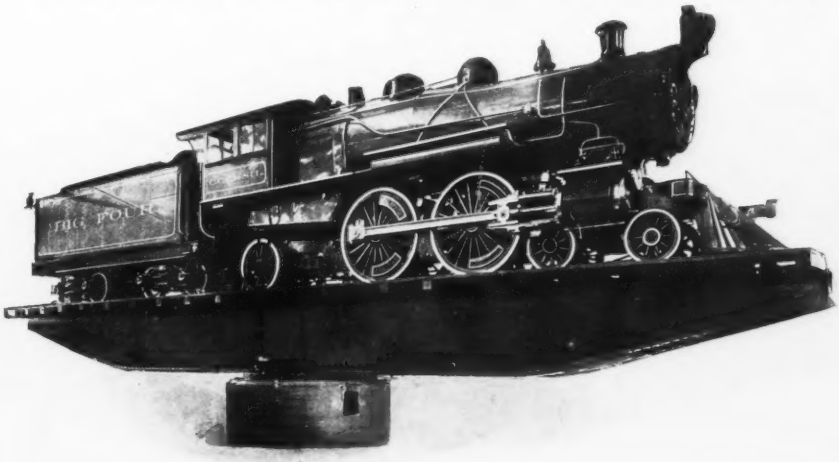
INVENTION AND PROGRESS IN SCRAPING- AND ROLLING-MACHINES, STONE-CRUSHERS, ET CETERA.

By John Brisben Walker.

SCATTERED through the Exposition one may find much information concerning road-building. But it is certainly a great oversight that this subject, which is one of the most important before the American people to-day, should not have been presented in a way to give a lesson of the widest and most permanent value.

No fewer than three sets of calculations, made up by different experts, and starting each from an entirely different point of view, arrived at the conclusion that the loss to the United States through bad roads amounts each year to more than four hundred millions of dollars. This is a sum sufficient in itself to enrich a people. Therefore, instead of a few pieces of road, showing their construction in cross-section, there should have been brought into one place, within the Exposition, every kind of implement known to road-builders, and these should have been shown in active operation. It seems unkind to criticize where so much has been well done, but this oversight is certainly in the nature of a misfortune.

To begin with, we should have had the stone-crusher turning out various sizes of crushed material. Of late years these crushers have been constructed in portable form for use on small sections of road, where the road to be improved and the quarry were in the same vicinity. Especially was it important that the lesson of crushing stone uniformly into the size of a small pea was the most modern improvement in road-building; and that, in this size, blue limestone could be spread half an inch thick on a well-rolled clay, crowned up to the center, about ten inches in twenty-two feet, so as to make a watershed that is almost impervious to the rainfall, the fine limestone dust serving as a sort of cement.



LOCOMOTIVE AND TURN-TABLE IN THE PALACE OF TRANSPORTATION. A DYNAMO RUNS THE DRIVING-WHEELS OF THE LOCOMOTIVE AND TURNS THE TABLE.

There should have been four-wheeled road-scrapers exhibited in operation; and road-rollers packing down clay in preparation for limestone covering. Especially is the modern four-wheeled road-scraper little

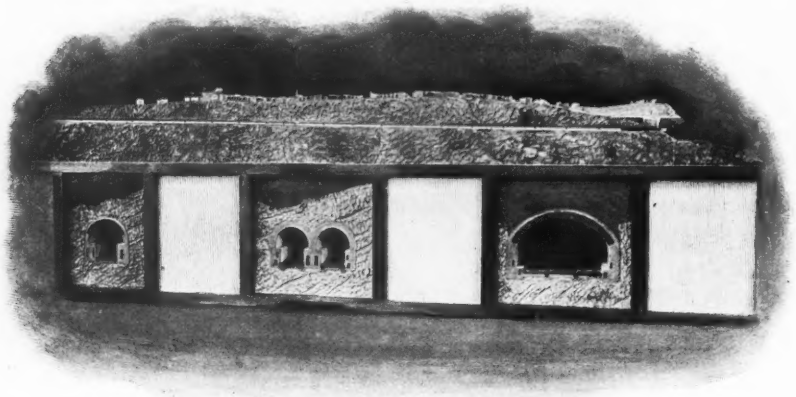
understood. No longer does road-making depend upon the crude implements of old. The modern scraper, hung underneath a wagon-frame, pulled by four or six horses, is operated through levers by the expert standing on the wagon and watching his work as it brings the clay or gravel with each sweep of the machine into an approximation of the proper curve.

There should have been exhibited one of those road-machines which plow up the clay and deliver it to side wagons.

There should have been exhibited the most modern machinery for the preparation of the cement-tied foundations which nowadays are placed under the various preparations of asphalt. For instance, there is one mixing-machine, placed for convenience on four wheels, horse-drawn when necessary to move it. A boiler and engine furnish power to drive a twelve-foot shaft along which, in worm alignment, heavy blades are attached. Into the box which surrounds this shaft, ten or a dozen men shovel cement, sand and stone in their proper proportions. From holes in a line of pipe above the box, water trickles down in the desired quantity. So thorough is the mixing given to the material thrown into the box, that when it is driven out at the end, by the worm motion of the blades, it is in perfect condition for laying —better even than could be accomplished by the most careful man-working.

There should have been exhibited road-sweeping and road-sprinkling machinery, with water emitted under heavy pressure. It has been found by experience in Paris and New York that the true method of cleaning a street is with jets of water driven out against the asphalt or stone under high pressure. In Paris they have automobile cars which not only move the sprinkler, but pump up the air-pressure required.

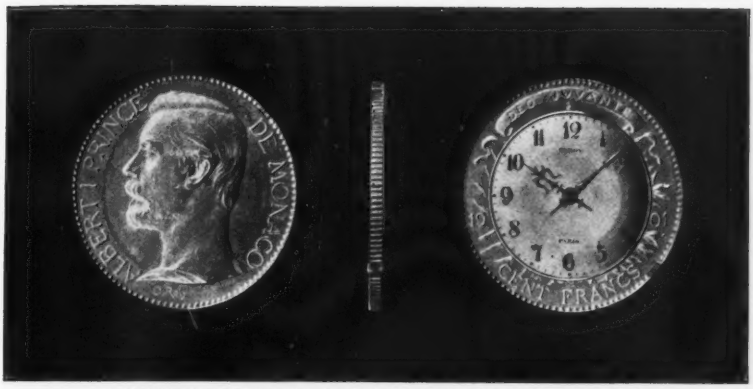
A form of pavement which is coming much into use in those parts of the country where stone is scarce, is of brick laid edgewise upon a carefully leveled and rolled roadway, covered with five or six inches of sand.



ELEVATION OF TUNNEL UNDER HUDSON RIVER AND NEW YORK CITY, WITH CROSS-SECTION OF SINGLE-, TWIN- AND THREE-TRACK TUNNELS.

Still another form of road consists of two narrow iron tracks which are put down on a country road at a comparatively small expense, and the claim is made that they furnish a highway so entirely devoid of friction as to permit the maximum load to be hauled with the minimum horse-power.

Perhaps it is too much to expect that the Exposition management should have awakened to the importance of a subject regarding which the American people are so supine. But it is not too late to correct this feature of the Exposition for the benefit of the great crowds of farmers which will be in the World's Fair in September or October.



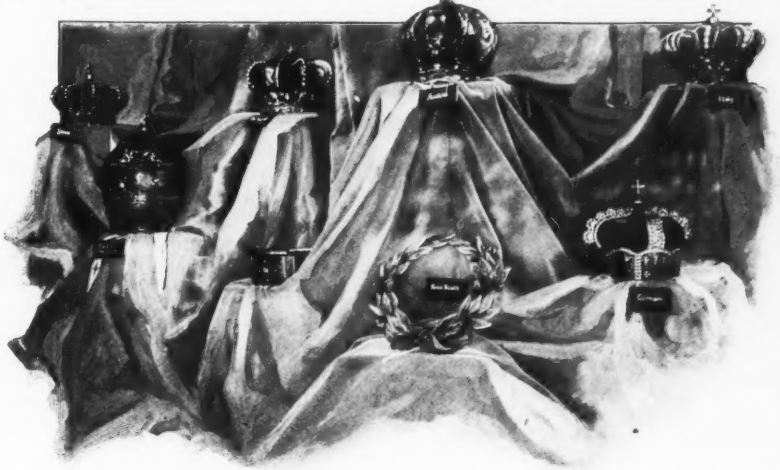
A MARVELOUSLY WROUGHT WATCH SET IN A GOLD COIN—EXACT SIZE.

XXI. ARTICLES OF LUXURY AND CURIOUS EXHIBITS IN THE PALACE OF VARIED INDUSTRIES.

By John Brisben Walker.

A NOTABLE exhibit at the Columbian Exposition in Chicago was that of the diamond industry. The blue clay had been brought from South Africa and was being washed and sorted within a large glass case. Favored visitors were taken inside and the processes explained to them, and they were permitted to hold a handful of rough diamonds.

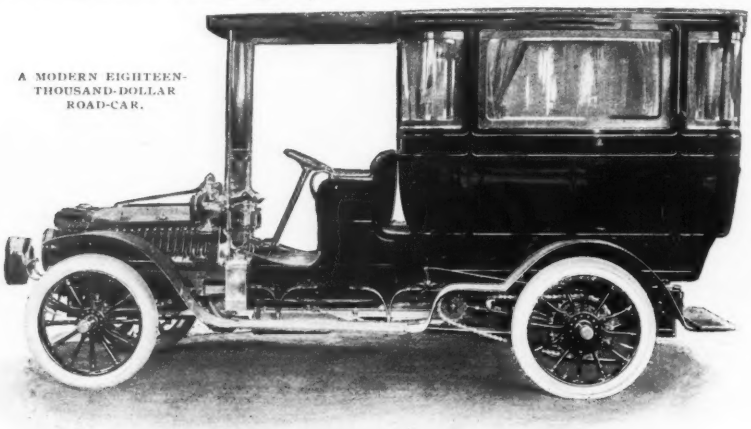
There is no exhibit of this kind at the World's Fair of 1904. The men who control the diamond industry are not explaining to the public much about diamonds. In fact, the public know already too much. The best information is to the effect that for years the workers of the diamond-mines have not dared to put their product on the market. Tens of



REPLICAS OF THE CROWNS WORN BY EUROPEAN SOVEREIGNS. THE EMPEROR NERO'S WREATH IN CENTER OF BOTTOM ROW.

millions of dollars' worth of diamonds are salted away in vaults, while the taste of the public is carefully cultivated through skilfully prepared newspaper articles. The diamonds are let out no faster than the gullible public will consume them. But it is believed by not a few people that if the diamonds now in sight were placed freely upon the market, the price of this stone would fall to twenty cents on the dollar. Yet from time to time there is a cheerful chirp in the press to the effect that diamonds are steadily advancing in value.

1904, however, beholds a new situation in the diamond industry. Immense deposits have been discovered in the Transvaal, covering an area of thirty-eight square



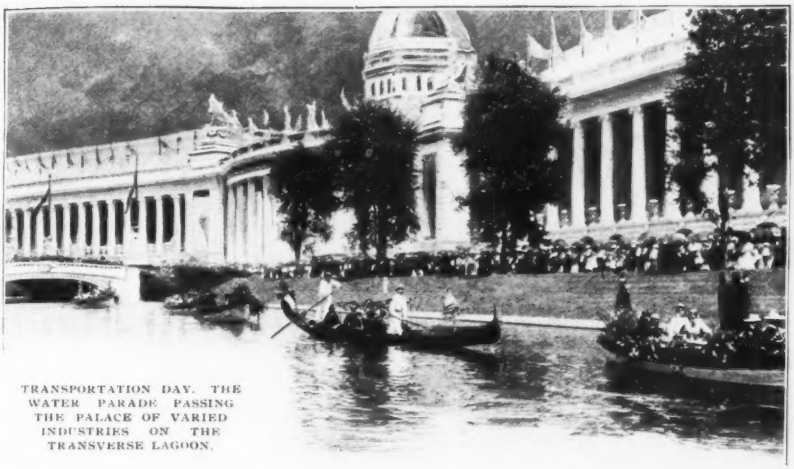
A MODERN EIGHTEEN-THOUSAND-DOLLAR ROAD-CAR.

miles A recent article in the London "Economist" said: "The diamond is essentially not a precious stone like the ruby and the emerald, and its price has been kept up by a monopoly only. If the DeBeers Company liked to work all their five or six mines to their full pressure, they would produce stones far more rapidly than the selling syndicate could get rid of them, and the market would be flooded. . . . The Premier in the Transvaal produced seventy thousand carats of diamonds in April. It can work for years to come more cheaply than the DeBeers can, and when work at full pressure is started, its output of stones will be so great that the DeBeers monopoly will be dealt a serious blow."

A novel installation is that of a diamond collection in the French section. On square white-velvet plaques are inset diamonds of fabulous value, in the form of necklaces. Here is found what is said to be the only red diamond in the world. When one first sees this exhibit, he is under the impression that stones in various colors are used. But the Director of the French section stated that the entire exhibit is one of diamonds—a collection which has occupied more than twenty years in the getting together.

Amongst them is a blue pear-shaped diamond valued at one hundred thousand dollars. Above it is a small yellow diamond, and above this again is one almost terra-cotta. The little case containing this collection, in the center of the aisle, is about eight feet square, and the diamonds in it are worth about one million dollars. One of the perfectly pure, blue-white, pear-shaped diamonds, single stone, is valued at eighty thousand dollars; and another, canary-colored, one hundred and twenty-four carats, at eighty-five thousand dollars.

Still another case in this French section contains a ring on which is inset a watch, the watch itself not taking up more than the area of a seal and being less than half an inch in diameter. A row of diamonds in an ellipse runs around the exterior of the ring, and at each end are two cupids



TRANSPORTATION DAY. THE WATER PARADE PASSING THE PALACE OF VARIED INDUSTRIES ON THE TRANSVERSE LAGOON.

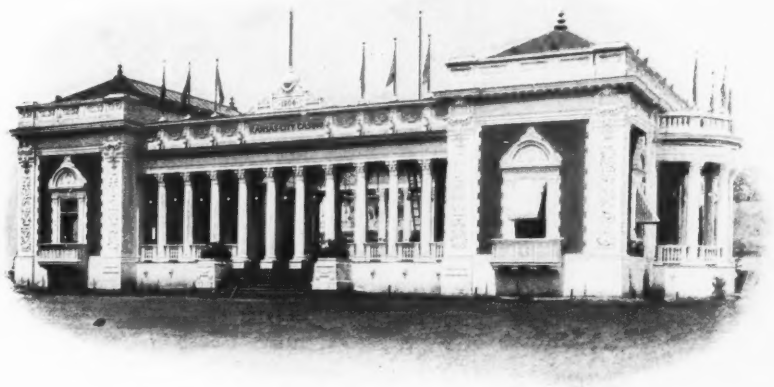
with hammers infinitesimally small. When a secret spring is touched, these delicate hammers rise and strike the hours against golden bells, producing a sound distinctly audible. The value is placed at the modest sum of twelve hundred and fifty dollars. Four years were consumed in the manufacture of this tiny watch, the operator working all the time with a microscope.

Another novel watch is a coin of Monaco, of the twenty-dollar size, milled and no thicker than the ordinary coin. Apparently there is no opening, and yet on one side is the face of a watch and within are works which keep perfect time.

Another most artistic creation is a watch intended to be worn as a locket, the white face surrounded by blue enamel inset with diamonds, and, contrasting with these, a row of twenty-four pearls, each a fourth of an inch in size and seemingly perfect. If any one objects to paying twelve hundred and fifty dollars for so small a watch, there are others almost equally small which are sold for only five hundred dollars.

A necklace of l'Art Nouveau is exhibited, composed of more than sixty figures intricately intertwined, forming a setting for thirty sapphires.

The most beautiful bronze displayed is



THE KANSAS CITY CASINO.

that of Gérôme's "Cæsar Crossing the Rubicon."

One of the evidences of modern extravagance is found in an ornament of novel style for the breast, the price being the moderate sum of forty-two thousand dollars. Not content with this enormous expenditure, the jeweler thought it necessary to cut in two a large emerald so that the jewel to be centered on the right breast should be the exact color of that centered on the left.

Another ornament is in the form of a cornucopia an inch and a half in length, with flowers in jewels of various colors at the end. The body of the cornucopia, tapered to an eighth of an inch and spread out to nearly three-fourths of an inch, seems to be cut out of a single diamond.

AN INDIAN PRINCE ON THE PIKE.

A very curious ring is composed of two winged dragons grasping a golden frame, in which is inset a beautifully painted portrait, perhaps three-eighths of an inch from top to bottom. Over this is what seems to be a glass frame, but inquiry develops the fact that this also is a slab extravagantly cut out of a large diamond.

There is a table-cloth in lace, exquisite in design, but costly beyond measure.

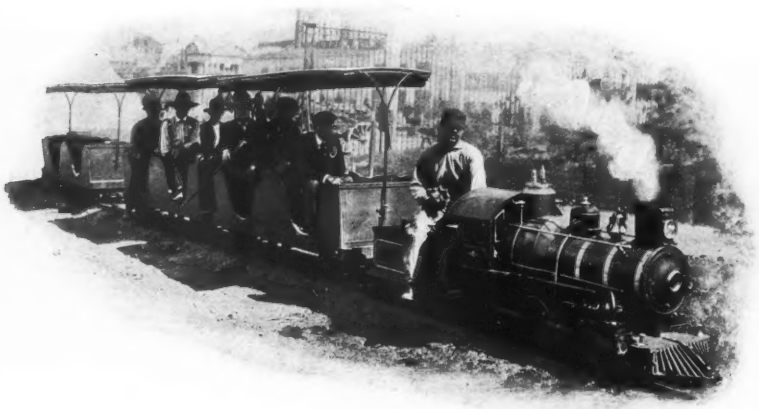
Another luxury is a jewel-casket composed of slabs of niphrate, and heavily bound at the corners and on all edges in silver.

Great Britain makes an extensive exhibit of articles of luxury, and some things that are very beautiful without being very costly. But as a rule they appeal to the pocket-book.

In silver the most extensive exhibit is an imitation of old English ware. There are Americans, whose genealogical proclivities are longer than their family trees, to whom this will appeal strongly. Such a public display of imitated wares, however, detracts something from the ideas which have attached to "old family plate."

A single exhibit of china by one of the English exhibitors represents an investment of over one hundred thousand dollars—figures which illustrate very well the immense values involved in the displays made at this Exposition.

While on the subject of ceramics, I



LONG-DISTANCE TRANSPORTATION ON THE FAIR GROUNDS.

TRANSPORTATION DAY AT THE FAIR. THE OLD AND THE NEW—A WATER PROCESSION OF MOTOR-BOATS AND GONDOLAS ON THE LAGOONS.

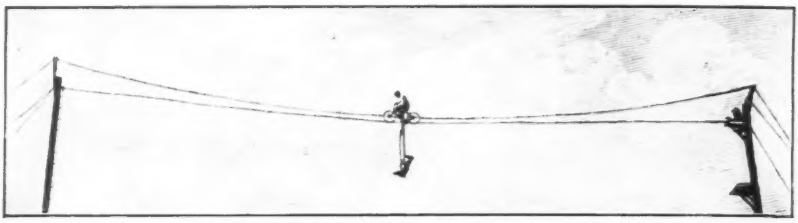
should mention that one of the most beautiful objects that came under my eye was one of color. It was shown in a duplicate of the famous "Peachblow" vase. In color it is said to be so exactly similar that only a man of the highest expertness can distinguish between them; yet one was worth seventeen thousand dollars, and this is worth but twenty-five dollars. But there are vases of Doulton ware at the Exposition which are valued at twenty-five hundred dollars, others at fifteen hundred dollars, and a single plate at five hundred dollars.

The American woman who visits the section of Irish linen will find something that is truly beautiful, with cost in proportion to real merit. Another very attractive exhibit in the English section is a teagown of Limerick lace, with lace coat and flounce. It is a work of art, and I turned to Colonel Watson, the Director of the English exhibit, who had been kind enough to call my attention to it, naturally expecting to hear that the price was well up in the thousands, only to learn that this exquisite bit of work came within the limit of six hundred dollars.

Another very beautiful exhibit in the English section of the Varied Industries Building is a bedroom with the walls paneled in polished woods up to a height of about eight feet, and reaching entirely around the room, except where the mantelpiece and wash-basins interfere. Every panel opens and gives access to drawers, closets, et cetera.

In every part the British exhibit is largely one of luxury. Occasionally the luxurious and the strictly useful blend together, as in the case of the Roman bath, sunk in the floor, the sides of the bath and room beautifully inlaid with marble, the ceiling arched, the electric lights placed artistically—at once the best of Rome and of London. This is undoubtedly the finest bath shown at the Exposition. It is worth while, however, for the average man and woman to know that nearly the same results, hygienically and in actual comfort, may be obtained with a tin pan four feet wide and six inches high, at a cost of three dollars instead of three thousand; and it has the additional advantage that it can be kept in a convenient nook of the humblest bedchamber.

A diamond necklace valued at two hundred and fifty thousand dollars is exhibited in one of the cases of the Varied Industries Building. Two of the diamonds were worn as cuff-buttons by Boss Tweed, and two other diamonds belonged to May Yohe. The large stone in the center is the one given by Napoleon to Josephine, and



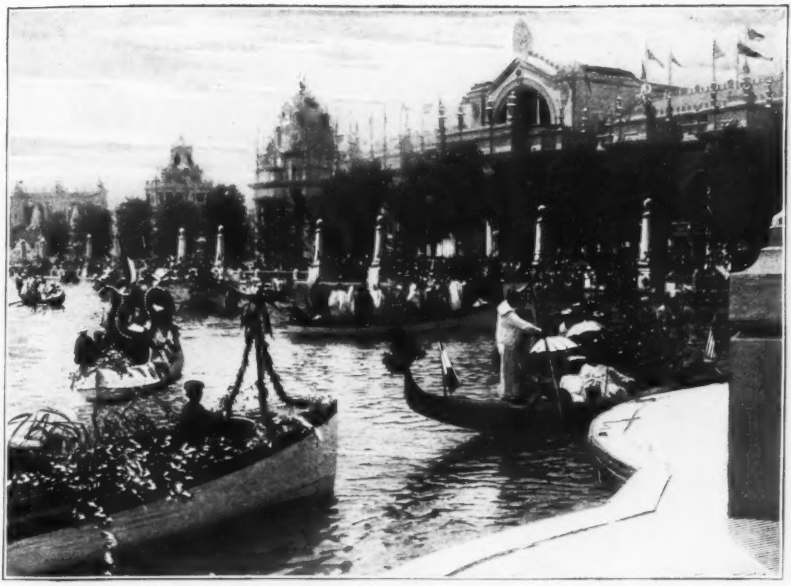
ONE OF THE DARING FEATS TO BE SEEN ON THE PIKE.

the corresponding one on the other side of the center pearl was owned by Maximilian. Later on it was brought to the United States, and, because entered fraudulently, was sold by the customs at auction. If their stories could be told, doubtless the others have intricate histories also—strange and wonderful enough to make a book. The title might properly be "The Varied Industries Necklaces."

One other mention of articles of luxury and I will close. Amongst the foreign exhibits brought over is a collection of the crowns used by the potentates of the several nations. Whether this was suggested by the talk in the American journals regarding the growth of imperialism, or whether the jeweled headpieces used in the boxes of our Metropolitan Opera are to be elaborated, is not suggested by an inscription on the collection.

As luxury increases, no estimate can be made of what the future will bring forth, unless indeed there come a time when common sense will call a halt. There has, however, since the Chicago Fair, been a change in the viewpoint of the world with regard to articles of luxury. In former days the possession of costly clothes and furniture gave a sort of prestige to the person who chose to display them. The wonderful increase in wealth has enabled so many people to present these outward appearances, which were formerly signs of station, that less and less attention is each day given to this sort of thing.

ONE OF THE MANY BEAUTIFUL BOOTHS.



TRANSPORTATION DAY—THE WATER PARADE IN THE GRAND BASIN.

XXII. ANTHROPOLOGICAL:

CONCERNING THE EARLY BEGINNINGS OF MEN AND WOMEN.

By John Brisben Walker.

ONE of the most interesting places for half a day is to be found in the Anthropological Department, under the charge of Doctor McGee, of the Smithsonian Institution, located in a building belonging to the group of permanent college structures. The exhibits are so arranged that one may make a study of things from the very beginning of time. One almost regrets that some of them are not placed in juxtaposition with those of the latest modern type. For instance, in the Egyptian room we find figures, reproduced from Egyptian paintings and sculpture, engaged in the ordinary household avocations, wearing beads that are actually taken from the mummies of the Egyptian tombs, and other articles and costumes that have the same date. A lounge-cover of colored cloth might have been purchased in St. Louis but yesterday; the colors are as fresh and the pattern almost the same as that of an American weaving of 1904. In this department, as elsewhere, the distinguishing characteristic is the practical testing that has been carried on. One is that of anthropometry, or the measurement of the various members of the human body. This work has never been done on such an extensive scale as will be practised at this Exposition, because there are now on the grounds more than forty different peoples, and some of them number as many as fifteen hundred. In pursuit of the ends aimed at, the length and height of skull, the width of forehead, the size of ears, the projection of the lower part of the face, and many other measurements, are being carefully taken.

In the Department of Psychometry tests will be made of the quickness of mind of these various races. Ingenious apparatus has been invented to show their intelligence, and these tests are begun with the monkey

and go on up to the highest development of man. One of these which the writer had the opportunity to try, requires one hundred efforts before the average monkey becomes proficient. It was with a feeling of pride that the writer operated the apparatus successfully the first time, showing, according to Doctor McGee, one hundred per cent. greater efficiency than the ordinary monkey of Italian commerce.

AN ARTISTIC MANTELPIECE IN THE GERMAN ARCHITECTURAL AND HOUSEHOLD ART EXHIBIT.

In another department Doctor McGee has admirably arranged the development of three important ideas in savage existence.

The first is that of the evolution of the sharp edge. At the beginning we find the crudest forms of stones. Then, as the idea penetrates the savage brain, the stone is selected with a sharper edge, and from this we proceed to the most carefully chipped flints which served as axes for cutting wood and for battle. Next, we find the copper beaten out to imitate the stone implement. As the intelligence developed, this took on an edge, and if the reader will turn back to the description of the Mining Department, he will find exactly the process in use in one part of Mexico to-day which this original savage went through six thousand years ago in order to secure his edged copper implement.

Few people in this day of matches have any idea of the ingenious methods which were resorted to by the original savage to secure fire. It was not the mere lighting of a safety-match as now, but a serious effort of skill with implements fashioned especially for the purpose. In the east of Asia, where the bamboo grows, the production of fire takes the form of the bamboo saw operating on the half of a cylinder of bamboo, slightly notched so that when the saw is passed rapidly backward and forward in this notch, and a little tinder placed in the same cylinder below, the rapid motion so heats the wood that fire is created and a glow communicated to the tinder—this in turn being blown into a blaze. Another form is that of a wooden stick grooved, and in it operates another stick. The apparatus is named "fire-plow," and the rapid motion of the stick along the groove generates the necessary heat and communicates it to the tinder placed in one end of the groove.

A little farther along in the same case are shown several forms of the rotary fire-drill. A hole is bored a half inch or so in a piece of wood, and a stick fitted into the end of this. A handle like that for an auger, with a hole to fit the other end of the stick, keeps the stick in a vertical position. Around it is a leather thong, twice turned. This, drawn quickly to the right and left, gives a whirling motion to the wood, and presently fire is produced by the friction of this motion, and communicated to the tinder. Still another form of this is where a bow holds the two ends of a thong, and is turned with a motion like that used in playing the bass viol. And yet another is the fire-pump. This consists of a hollow stick with a piston operated up and down with such violent motion that it presently creates sufficient friction to set fire to a small amount of tow in the bottom of the pump. In this same exhibit there are found also numerous forms of aboriginal

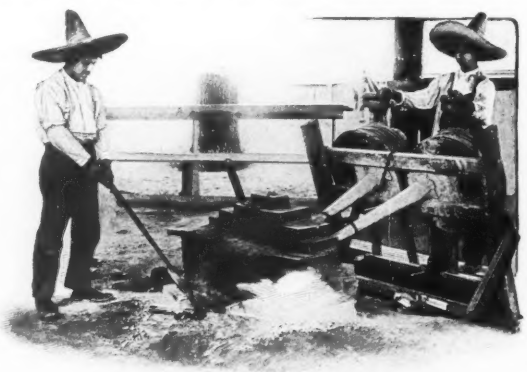
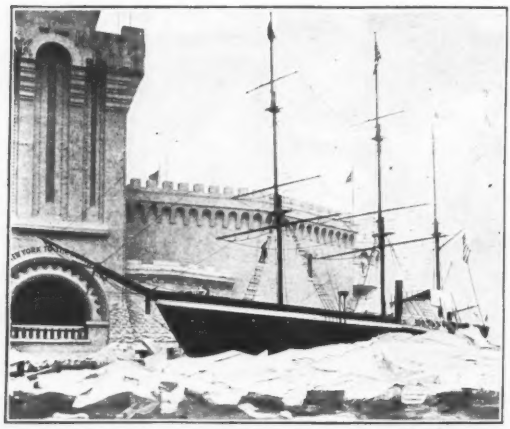


EXHIBIT OF MEXICAN COPPER-MINING—DRAWING THE BLAST-FURNACE.

CROWD ON THE PLAZA WATCHING THE TRANSPORTATION DAY CEREMONIES.



"FROM NEW YORK TO THE NORTH POLE." A REPRESENTATION OF LIEUTENANT PEARY'S SHIP IN THE ICE.

pipes, some of which illustrate the close connection between the primitive idea of fire and the custom of smoking.

The third primitive idea concerns the wheel.

Long before the wheel was invented, it was the custom of the Indian to shape a round stone and bore a hole through the center. A game was devised with this which involved the rolling of the stone along a smooth surface, and shooting an arrow at the hole in the wheel. If the arrow penetrated the hole, it was considered to be a favorable omen. From the use of the gaming-stone for divining purposes developed an idea of mystical potency in the stone itself, so that recourse was had to it in connection with the various industrial operations.

In another department, those who have read of and become interested in the mound-builders find a most complete collection showing the implements and illustrating the habits of the people who lived on the banks of the Ohio. This people produced a quality of arrow-heads and bone fish-hooks that if placed on the market to-day would occupy the same relative position as that of the highest Pittsburg steel products. I have fished on the Ohio with a steel hook that was not very much different from the bone hook of the mound-builders.

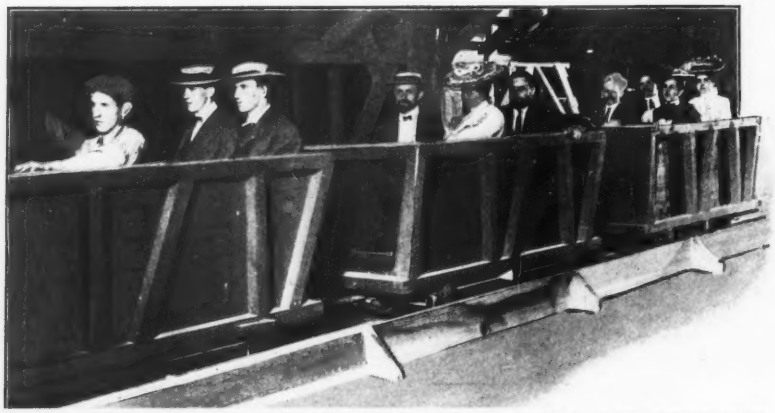
The needle implement trade of the mound-builders seems to have been brought to a high state of perfection also, but the article as known to them consisted of a perforated bone about three inches in length used for sewing in exactly the same way that the shoemaker of to-day uses his awl and thread. The bone hair-pin production of the mound-builders is also notable. While most of these range from two to four inches, there are several that are quite long, one of them being nearly ten inches in length, with a carved bird's head that would not be an ungraceful ornament for the modern woman.

There is also shown a collection of the food-products of the day, consisting of corn, a snap-bean, hickory-nuts, et cetera. A remarkably fine collection of wampum belts is on exhibition. Here are the belts which were prepared by the Indians to indicate the signing of a treaty, serving the same purpose as the English parchment. These are all different in color, and have crude figures in varicolored beads intended to indicate the character of the treaty. Kept in the tent of the chief, they served to fix in the mind of all the terms of the treaty entered into, somewhat after the manner of the establishment of bounds in England two hundred years ago. Few schoolboys who have used the term "beating the bounds," know the significance of this phrase. A healthy young boy who would presumably have a long life was taken to the boundary-stone and there given a severe whipping. The beating was not for cause, but with reference to futurity, intended to fix firmly in his mind through the seat of his breeches the location of that particular stone, so that when a man of eighty or ninety he would be able to recall the event, and point out the stone with accuracy.

TRANSPORTATION-DAY CEREMONIES—EDWARD H. HARRIMAN, THE RAILROAD KING, SPEAKING IN BEHALF OF NEW YORK STATE.

Curiosities have been brought from all parts of the world. One that will interest

THE FESTIVAL HALL AND ITS SURROUNDINGS, SHOWING DANIEL C. FRENCH'S GREAT STATUE OF NAPOLEON.



DESCENDING INTO THE COAL-MINE WORKING A NATURAL VEIN OF COAL IN THE MINING GULCH.

many persons is a trophy of the head-hunters of South America. An Indian chief from the upper Amazon, killed by the Jiberos, had his scalp and the skin of the entire face removed from the skull. The hair seems to be perfect, but the facial integument has dried up until it resembles that of a small puppy-dog; yet lips and nose, eyes and ears, are perfectly shown, even including the perforations, and on the chin are the remains of a scraggly beard. The hair itself is perhaps twenty inches long, the whole constituting a most ghastly trophy. The attendant in charge explained that the hair continues to grow.

Three implements have special interest for women. One is a mask which guards the face of the Indian medicine-man. Another is the sacred flute, and the third instrument is the wooden sword of execution which gives her her exit into the next world for having trespassed by even so much as looking upon these special belongings of man. Bloodstains mark the wooden sword, and the reader may make up any nice story he chooses regarding the use of this instrument to get rid of a wife that is no longer desired.

In a little case of palm-leaves, half large enough to be a golf-bag and very much resembling it in shape, were a number of bobbin-wound delicate pieces of black palm. Wondering at this curious implement, it was drawn forth and the discovery made that here was the real, genuine poisoned arrow of Mayne Reid's stories. Hanging against the wall were three splendid specimens of blow-guns, through which these poisoned arrows can be driven to the surprising distance of two hundred feet. The guns themselves are nearly ten feet in length, and show the utmost care in preparation.

Another exhibit in the same line is a poisoned arrow for a bow. The arrow is five feet in length, tipped with burned, fire-hardened palm-wood. The warrior who carries this dangerous implement has to take almost as much care to protect himself from it as does his enemy. A cap of palm-leaves eight inches in length is fitted to take seven of these arrows, and guard the user carefully against the violent poison which means, even in accidental pricking of the hand, certain death.

But there is room to give no more than this suggestion of the interest which attaches to this department with the long name.

AN EXHIBIT OF CANDY-MAKING MACHINERY.

TYPICAL OF THE ENTRANCES TO THE PIKE SHOWS.

XXIII. THE PIKE.

By John Brisben Walker.

AT one end of the Pike lies The Alps, a delightful Tyrolean village at the foot of painted snow-clad mountains, which in the late afternoon look very like the real thing. On the lower reaches are trickling rivulets of real water—some green-growing grass, and actual trees and moss; and where mother earth leaves off and the painted pasteboard begins does not make itself very clear, so that, for all the eye can tell, the whitened summits may be two hundred or two thousand feet above you.

The music of an excellent band, too, diverts your attention from the unresemblance, and a thousand people sitting at little tables around the stand form objects of more immediate interest for wandering eyes. Picturesque Tyrolean cottages, an ancient church, from whose tower a bell strikes the all too passing hours, sanded walks, and pretty flower-girls, modestly offering a boutonnière, all help to distract, and if upon the opalescent-blue heights the snow is not real, you do not care; the place is jolly enough for a dinner—for which the prices are high—after your long day of tramping through miles and aisles of instructive exhibits. So you sit contentedly over your meal, in no hurry to finish, the daylight growing dimmer, until suddenly there is a flash, and you are in a fairyland of electric lights.

I had for my companion at my first dinner here Captain Conrad, of the United

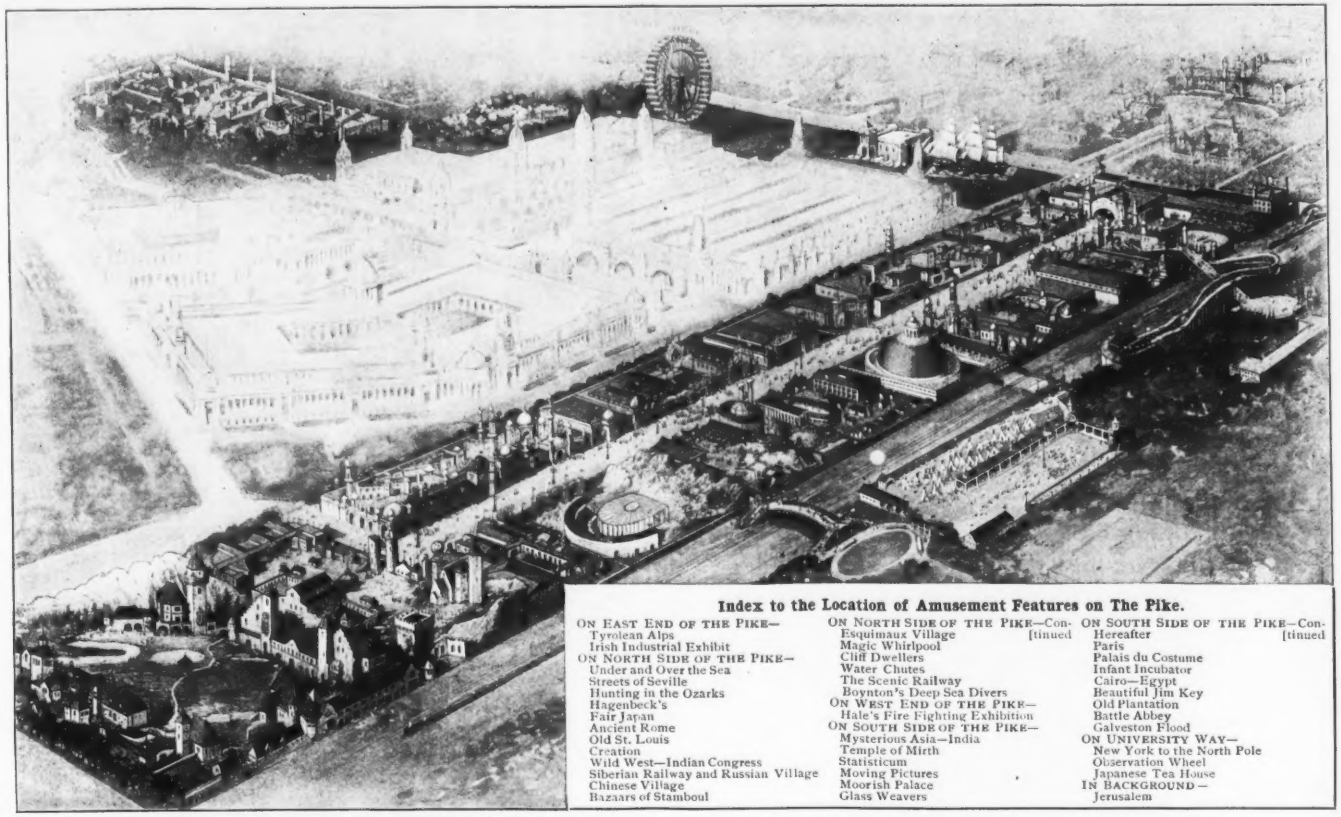
ORIENTAL JUGGLERS ON THE PIKE ATTRACTING ATTENTION TO THEIR SHOW.

States Army, who was detailed on duty in connection with the Jefferson Guard. He gave me some idea of the intricacies of policing and protecting the valuable exhibits under their charge, and told how, occasionally, when young men appeared who were more than jolly —young cubs with more money than brains—it became necessary to detail some of his stoutest guardsmen on Pike duty.

It must be kept in mind, in considering the World's Fair, that it is not instituted primarily for the denizen of the great cities. The New Yorkers who will visit the Exposition will form a comparatively small number of the whole. Even the most blasé visitor from the world's capitals may discover new and first-class entertainment in the "Boer War," in "Creation" and in the "Naval Battle of Santiago." But the men and women of the farms and the small towns find in it not only lasting instruction, but endless amusements which are to them both novel and exciting. To them every part of the Pike is interesting, even the poor shows, and there are a number of them. Six nights of pleasurable excitement may be obtained by carefully measuring out the instalments, and mixing much that is incomparable with much that is indifferent. But nearly all are worth seeing.

Just adjoining the Tyrolean Alps is the Irish Village, which will have an interest for all, but especially for the sons and daughters of Erin. There is an exhibit of Irish industry suggestive of what our English friends generally consider the chief staples of Ireland, "whisky and hell." They show how they raise the whisky, but the other crop is omitted. There is a splendid exhibit of Irish laces and also of cordage, and of Irish homespun cloths for men's wear which are of artistic design and serviceable texture.

AN INDIAN OF THE WEST MEETS WITH SOME INDIANS OF THE EAST.



Index to the Location of Amusement Features on The Pike.

ON EAST END OF THE PIKE—
Tyrolean Alps
Irish Industrial Exhibit

ON NORTH SIDE OF THE PIKE—
Under and Over the Sea
Streets of Seville
Hunting in the Ozarks
Hagenbeck's
Fair Japan
Ancient Rome
Old St. Louis
Creation
Wild West—Indian Congress
Siberian Railway and Russian Village
Chinese Village
Bazaars of Stamboul
Esquimaux Village
Magic Whirlpool
Cliff Dwellers
Water Chutes
The Scenic Railway
Boynton's Deep Sea Divers

ON WEST END OF THE PIKE—
Hale's Fire Fighting Exhibition

ON SOUTH SIDE OF THE PIKE—
Mysterious Asia—India
Temple of Mirth
Statisticum
Moving Pictures
Moorish Palace
Glass Weavers
Hereafter
Paris
Palais du Costume
Infant Incubator
Cairo—Egypt
Beautiful Jim Key
Old Plantation
Battle Abbey
Galveston Flood

ON UNIVERSITY WAY—
New York to the North Pole
Observation Wheel
Japanese Tea House

IN BACKGROUND—
Jerusalem

BIRD'S-EYE VIEW OF THE PIKE AND OTHER AMUSEMENT FEATURES, SHOWING THEIR LOCATION WITH REGARD TO THE MAIN EXPOSITION GROUNDS.

AN EAST INDIAN DANCER.

You have entered the Irish Village from the outer avenue, and as you emerge on the Pike proper you look up a broad paved highway, half a mile or more in length, lined from beginning to end with bizarre-looking edifices, lined likewise with a dense crowd thronging up and down under the myriad electric lights, men and women so closely packed that a wheeled chair is pushed through the crowd with difficulty.

As you pass along this plaisance, you are greeted—if you are from New York—by some old Coney Island friends and many new ones. Hagenbeck's never-tiring—because ever-changing and always excitingly perilous—exhibit of man-eating animals occupies a generous space. Therein at one performance you will find four distinguished and defiant denizens of the desert, placed upon stools, and under the control of the eye, whip and pistol, and above all of the nerve, of a pretty woman; just as you have seen four distinguished men in a drawing-room maneuvered around at the will of a pretty face, backed by a clever mind; and sometimes even minus the latter.

When the four lions are comfortably seated, the pretty figure begins to pirouette around the circle, and as each lion is approached, the light foot of the dancer is thrown into the air so dangerously near its jaws that the spectators visibly shudder. Again the dainty foot is thrown into the air and withdrawn so instantaneously as barely to save it from mangling by the powerful jaws which launch out savagely. Nothing daunted, the dancer again, all the while swaying gracefully to the music, raises her foot. This time the lion suddenly reaches out his head and snaps his jaws not two inches from the foot. The clever woman cracks her whip determinedly in the animal's face and moves on to the next lion. The fact that every week some one of Hagenbeck's performers is sent to the hospital—and sometimes worse—does not lessen the long breath of relief of the average spectator as he or she passes out to the Pike.

"In Mysterious Asia" is an attractive sign that draws its crowds to where much of interest is to be found for dwellers in a land so dissimilar to India. "The Japanese Village" is another bit of the East, and "Old St. Louis" tells its story of frontier life to young men and women who have never known anything but the electric street-car and modern existence.

The "Palais du Costume" is quite a different little bit, with its long, dark galleries, on either side of which are inset brightly lighted rooms showing the furnishings of all ages from primitive man up, and with figures costumed after the same periods. Some of these are extremely well done. Others are but so-so; yet on the whole the exhibit is worth visiting. At the end of the galleries, one arrives at an open stage set with the furniture of 1904. Upon it promenade half a dozen figures costumed in the

latest fashion. Some musicians are rendering lively music. The visitors sit in front of the stage and watch the young women parade up and down in their fine garments, much as one watches the wild animals in Hagenbeck's. It is rather sad that the fierceness of competition should drive nice girls into a cage of this description for the benefit of a curious and not too discriminating public.

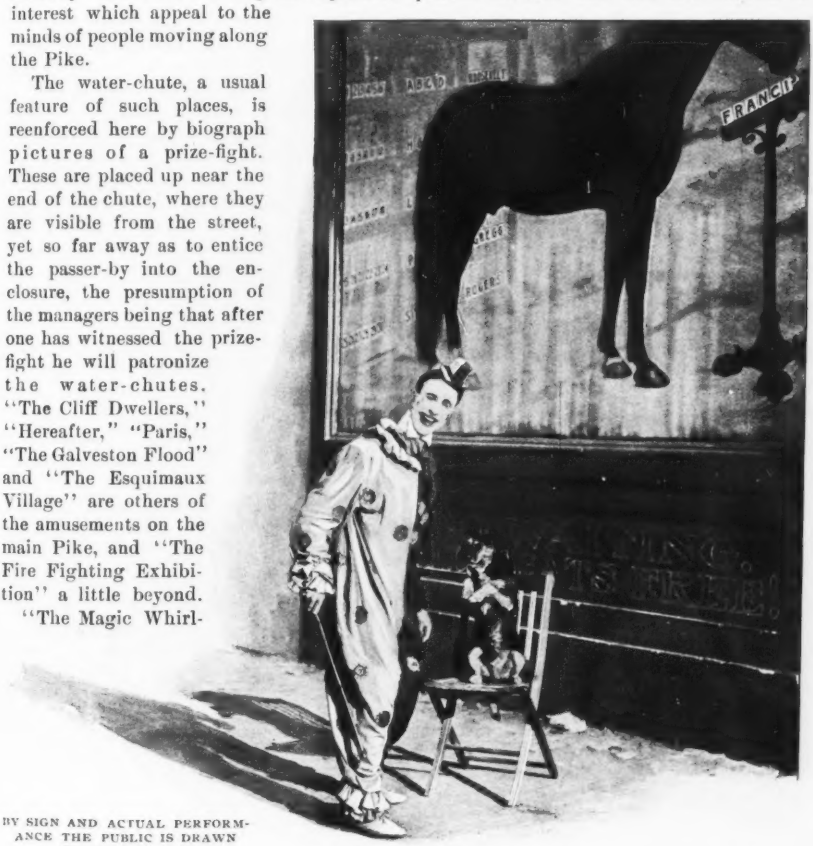
"Under and Over the Sea," "Ancient Rome," "The Wild West and Indian Congress," "The Siberian Railway and Russian Villages," "The Chinese Village," "The Bazaars of Stamboul," "The Temple of Mirth," "The Statisticum," "The Deep Sea Divers" and "The Scenic Railway" are others among the objects of interest which appeal to the minds of people moving along the Pike.

The water-chute, a usual feature of such places, is reenforced here by biograph pictures of a prize-fight. These are placed up near the end of the chute, where they are visible from the street, yet so far away as to entice the passer-by into the enclosure, the presumption of the managers being that after one has witnessed the prize-fight he will patronize the water-chutes. "The Cliff Dwellers," "Hereafter," "Paris," "The Galveston Flood" and "The Esquimaux Village" are others of the amusements on the main Pike, and "The Fire Fighting Exhibition" a little beyond.

"The Magic Whirlpool" is a new and novel water-chute. From the street a great veil of water forty feet in width is seen descending in a cascade, and through it the visitor catches glimpses of boats whirling around a spiral, which come so very close to putting the occupants under the veil of the water as to raise anticipations.

The interesting North Pole trip exhibit occupies a great building and ship at the end of the Transportation Building. "Jerusalem," "The Boer War," "Creation" and the "Naval Show" have been made the subjects of special articles.

There are said to be along this great amusement highway fifty different shows, in the preparation of which have been expended between four and five millions of



BY SIGN AND ACTUAL PERFORMANCE THE PUBLIC IS DRAWN TO THE SHOWS.

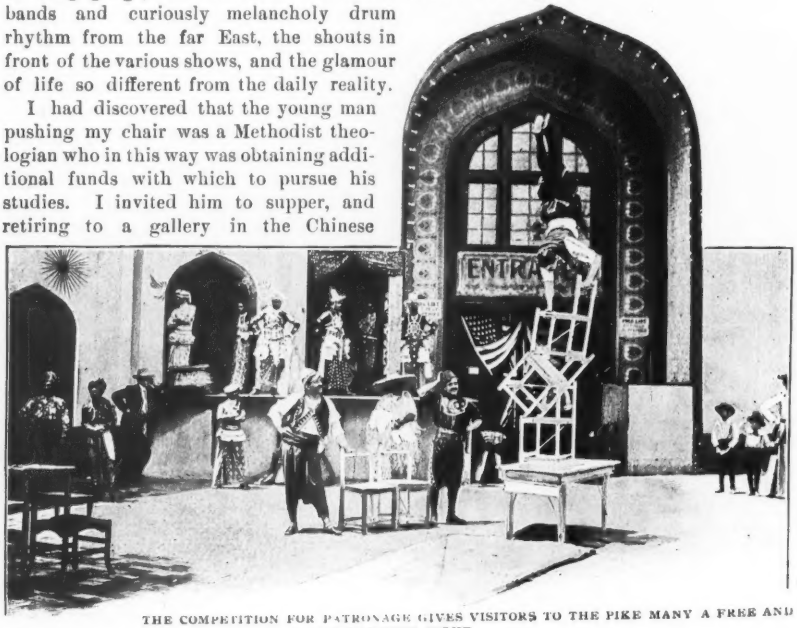
Copyright, 1904, by N. Lazarnick.
M. SANTOS-DUMONT INSPECTING THE RUINS OF HIS AIR-SHIP.

dollars. The guide-books say that no fewer than six thousand performers and fifteen hundred animals take part in these shows.

Tired of walking all day through the exhibits, I hired a wheeled chair for one evening and enjoyed for an hour a promenade along the Pike, with its lights, the clashing gongs, the mixture of a dozen bands and curiously melancholy drum rhythm from the far East, the shouts in front of the various shows, and the glamour of life so different from the daily reality.

I had discovered that the young man pushing my chair was a Methodist theologian who in this way was obtaining additional funds with which to pursue his studies. I invited him to supper, and retiring to a gallery in the Chinese restaurant, listened for another hour to the story of his life as a student, and on the Pike as a pusher of wheel-chairs. A great number of the young men similarly engaged are college students, who in this way secure an opportunity to see the Fair, and at the same time to earn a little money. They are, as a rule, men of a superior character, who recognize the importance of making their way in life, and who allow no foolish pride to interfere with their doing of useful work that at the same time affords them opportunities for acquiring knowledge.

There has not been a very nice discrimination shown in censoring the shows along the Pike—rather too much is it the old "Midway Plaisance" of Chicago. But one of the ways in which the world is advancing is in giving clean shows for the public. In the new Dreamland and Luna Park of New York city's great resort there is nothing that is low or suggestive, and as a consequence five times as many people go to Coney Island as formerly. That is one of the ways in which the world has been making progress since the World's Fair at Chicago.



THE COMPETITION FOR PATRONAGE GIVES VISITORS TO THE PIKE MANY A FREE AND INTERESTING SIGHT.

XXIV. GREAT INVENTIONS AND DISCOVERIES

WHICH ARE CHANGING THE WORLD.

By John Brisben Walker.

WHAT is the world destined to become during the Twentieth Century? The mind is lost in speculation when it reflects upon the marvelous manifestations of man's power to invent and discover which are given in the exhibits of the Louisiana Purchase Exposition. Practically every important invention has had its inception long after the beginning of the nineteenth century, and the eight or ten most important of to-day are so absolutely the creation or discovery of recent years that none of them was exhibited eleven years ago.

Let us make an enumeration:

RADIUM. Revealing an energy so powerful, inexhaustible and apparently so abundant in nature, that its substitution for other forms of light and power now in general use is within the range of possibility, this certainly deserves first mention.

Visitors to the Mines and Metallurgy Building will find interest in the large number of radium ores exhibited there. It is only a little more than a year ago that The Cosmopolitan published the first popular article calling attention to the far-reaching probabilities of this new metal, and suggesting that the metallurgists of the mining states should give special attention to the discovery of ores carrying radium. Never has response been quicker, and the results already secured give an idea of what is probably in store for us in the near future.

THE SUBMARINE. Visitors to Chicago will recall the full-sized brick-and-wood painted imitation of a modern battle-ship, planted on piles along the lake front. It was comparatively a new form of naval construction, and the enthusiasts felt that it was the last and final development of impregnability on the sea. These enthusiasts approved the voting of a hundred millions or so for this new kind of navy.

Well, eleven years have gone by, and that hundred millions that went into battle-ships, together with some hundreds of millions expended by other nations, is to-day old junk, because a new form of naval construction has been developed able to move beneath the waters—undiscoverable and therefore invulnerable—approaching its foe and placing a mass of high explosive beneath the unprotected parts of a great battle-ship, so that that pride of naval architecture turns turtle and goes to the bottom. And the statistics of the considerable number of battle-ships which have thus been destroyed show that they are built so as to insure the carrying down of an average of at least nine-tenths of their crews.

Strange to say, the government exhibits another large-sized model of the battle-ship, and no model of the submarine, and in doing this the Navy Department erects upon the records of the World's Fair a permanent monument to stupidity.

WIRELESS TELEGRAPHY. The discovery that the principle of sending electrical signals along a wire applied also to waves despatched through the ether, has been rapidly worked out, notwithstanding the opposition of the large vested interests which possibly may be affected by this new means of communication. New laws will have to be passed before the wireless telegraph can come into common use. So much that has been contradictory has been said by those interested in its success or failure that it is difficult for the layman to speculate on the true situation. Undoubtedly it must play a great part in intercommunication.

THE GAS-PRODUCER—CLEAR SKIES AND INCREASED POWER FROM FUEL. As the world's supply of coal begins to be exhausted in certain fields, there has come a discovery that is a complete revolution not only in the kind of power to be employed industrially, but in the skies of

great cities like London, Pittsburg and Chicago. There is to-day not a particle of excuse for any factory being allowed to belch forth masses of smoke. Such a condition is capable of remedy at the expense of a few dollars, and is a source of loss to the manufacturer every day it is permitted to continue. When the world calculates the loss of life through impure air, the injury to beautiful buildings, the inconvenience of smutting hands, face and clothes, the fabrics in upholstery and household use injured, this phase of the benefits to be derived from the new invention can scarcely be overestimated. But when, in addition to this, we realize that a pound of coal placed in a gas-producer and the resultant gas used in a gas-engine gives more than three times the power generated when employed under a steam-boiler, we begin to understand what an immense economy the world is on the eve of realizing.

This invention, which is described elsewhere—so simple in form that it ought long ago to have been understood and put in practice—

Will affect the production of coal-mines,

Will compel the manufacturers of steam-engines to convert their plants to gas-enginery,

Will increase the radius of men-of-war and decrease the coal-storage necessities of Atlantic liners by two-thirds,

Will give clear skies worth hundreds of millions of dollars to peoples who now live under a pall of soot and fog.

Yet, from talks with many men, I doubt if there are to-day a hundred people in the United States who fully realize the revolutionary character of this invention. Even those who are manufacturing gas-engines do not seem to understand its possibilities; for if the gas-engine of the Westinghouse Company is what is claimed for similar engines in Europe, then the turbine-engine which the same company is developing at so great an expense will be almost valueless. No ocean liner can operate steam-engines using three pounds of coal if gas-engines will do the same work upon one pound.

THE AEROPLANE.

The aeroplane will not reach the expected development at the St. Louis Exposition, owing to the fact that persons in charge of the expenditure of the one hundred and fifty thousand dollars appropriated had no knowledge, apparently, of the matter, and approached the subject from the standpoint of the race-track. We can imagine that they were estimable gentlemen who knew all about Missouri race-tracks, and could have but one idea, that of "a good run for our money." Add to this that the men wealthy enough to engage in the expensive work of aerial construction have been stupidly indifferent to what is involved in its accomplishment. Yet nevertheless there is the certainty of ultimate success if the necessary steps are pursued with one-tenth the care taken in the development of the automobile.

THE AUTOMOBILE.

The automobile is shown at the Exposition in its most perfected form for private use. The car for public transport of passengers and that for freight—the two chief forms in which the automobile will be of service to mankind—are notably absent in the Exposition. This would have been the most important part of the Transportation exhibit, and the regret must be very keen that the showing is so slight. The art itself has not made the expected advance, owing to two conditions:

First, the control of the streets of the great cities, and the opposition of street-car companies and existing forms of transportation to the introduction of automobiles—small unit cars going up to the curb to take up their passengers and delivering them directly at their doors, with a maximum of comfort and a minimum of stoppages.

Second, the fact that the delivery business of the cities is in the hands of men who have their investments already made and must hesitate to change to methods involving the doing away with wagons and horses, costing so many millions.

But this new form of carriage will become perfected, and then the great cities will spread out into the suburbs, and life on an acre will become a possibility for even the humblest class of people—first, because of the cheapness and quickness of transportation, and secondly, because of the things which a family will learn to do upon an acre that will bring income.

XXV. THE ART OF GOVERNING PEOPLES AS SHOWN AT THE WORLD'S FAIR.

By John Brisben Walker.

NEXT to the display in Education, the greatest exhibit at the Louisiana Purchase Exposition is that in connection with the Government of Peoples. Here we have, for the first time in history, governments lined up against one another, not in the Art of War as at Chicago, but in the Arts of Peace. Only the United States has seemingly misunderstood the purpose of the St. Louis Exposition, and has filled its costly building with great models of battleships, with displays of uniforms, and with many other things which pertain to the ages of barbarism.

It might almost be said that there is not a single exhibit in our national building showing intellectual activity in governmental functions. So lamentably deficient is our display in comparison with that of Germany, that it must be regarded as pitiable.

We are shown a record giving the story of every "dead letter" that went to the post-office between 1777 and 1788.

We have stuffed animals in numbers.

We have a cartridge factory turning out cartridges, and an extensive exhibit of guns.

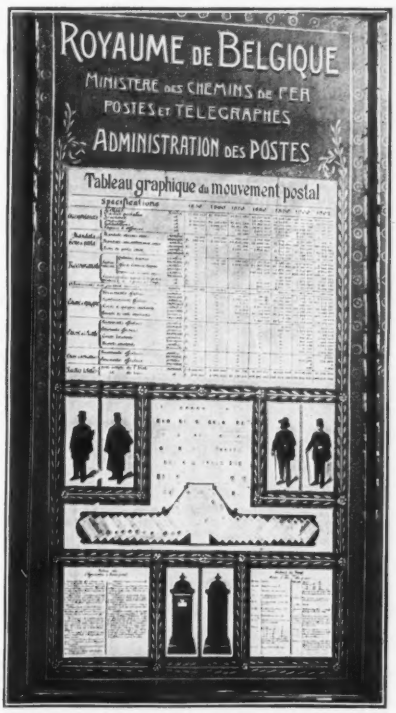


EXHIBIT OF THE BELGIAN MINISTRY OF RAILWAYS, POSTS AND TELEGRAPHS. STATISTICAL AND DESCRIPTIVE CHART SHOWING DEVELOPMENT AND GROWTH OF THE POSTAL SERVICE, 1850–1902.

In a specially constructed theater a biograph shows an impressive boxing-match on board the deck of a battle-ship; and in other scenes President Roosevelt is arriving and making a speech to the cheering sailors.

To pass through this magnificent Government Building one would suppose that we were the most warlike nation in the world; that we think of little except war.

Was there nothing to show of our government which would teach the visiting nations of the world what a Republic means and should mean?

In the German section there is issued a book of two hundred and forty-six pages, entitled

"The World's Fair at St. Louis in 1904.

"German Empire.

"Special Catalogue of the Hygiene Exhibition."

In this Imperial pamphlet the following is laid down as among the fundamental principles of government—that:

"The maintenance of the health of the individual is the chief requirement of the healthy growth of the state."

This exhibit is made upon altruistic grounds. "It is presented," says the catalogue, "because it is the duty of Germany to show the educated public, as well as the scientists to be gathered at St. Louis, what has been accomplished by hygiene." Germany,

PART OF THE EXHIBIT OF THE AMERICAN FEDERATION OF LABOR.

leading the world in science, takes pity upon less intellectual nations and gives them the results of her work. The basis upon which the German state is organizing its health laws is stated as follows:

"A recognition of the social-political principle, that the working capacity of the human body is state capital which bears the highest interest, has been reserved for the present generation. *This principle necessitates the maintenance of a high degree of health in individuals*, and consequently imposes upon physicians not only the task of curing disease, but that of preventing it. *All progress in this direction is synonymous with economic gain. On the other hand, health is the source of a nation's ability to defend itself and the first condition for the recognition of a nation's power by other countries.* The acknowledgment of this fact has induced Germany, in the last few years, to extend hygienic activity, hitherto applied solely in public affairs, to the preservation of the health of the individual, . . . thus nurturing a race powerful and robust enough to fulfil the tasks imposed on it by cultural progress. . . . The aim in view is to help the poor, the weak and the diseased, and thus institutions are called into existence which simultaneously fulfil social-political demands."

In other words, Germany has made the building up of the health of its people one of the chief of governmental functions, while in the United States we may be said to be scarcely farther advanced than those North American Indians who in a thousand curious and illogical ways attempted to heal their sick.

The statistics of Germany and the United States tell the whole story of intelligent and hygienic government on the one hand, and of lack of proper organization on the other.

In the entire German empire there were but two hundred and twelve cases of smallpox in 1902. In the United States two cities alone had, in 1901, nearly four thousand cases of smallpox—New York having nineteen hundred and sixty-four and St. Louis nineteen hundred and sixteen cases.

In Germany, in 1901, but one person in a million inhabitants died from typhoid fever, showing how Germany had been able to reduce its death-rate from typhoid in 1877, when the loss from this cause was sixteen times as great. Typhoid is the disease which above all others is suppressed by organized, scientific governmental effort.

The exhibits of Germany in other governmental directions are even more remarkable. Under state control, Germany has facilitated commerce and enriched its merchants and manufacturers by giving them a minimum rate for the transportation of goods. There, no private interests place a clog upon an interchange of trade. Packages exceeding a hundred pounds in weight are carried from one end of Germany to the extreme end of Austria-Hungary at a minimum charge, made possible by the throwing of all this business into one channel, and the consequent reduction of expense.

It is a melancholy fact that the United States Post-Office charges three thousand

per cent. more for carrying a package from New York city to Brooklyn than Germany requires for transporting the same package to the farthermost part of Hungary.

A COMFORTABLE WAY OF SIGHT-SEEING.

In the United States government's exhibit there is shown a country delivery-wagon, part of a system which has been put through Congress because of the "farmer vote." There should have been placed on this wagon a great placard reading as follows:

> Intelligent men will find it incomprehensible that the United States Government spends twenty millions a year in operating these country delivery-wagons, and then puts an embargo on their use by charging sixteen cents a pound for merchandise—a price three thousand per cent. greater than is charged by Germany, Belgium, and other countries for the same service: done for the sole reason that the great express companies contribute to the campaign funds and maintain officers of their own companies in the United States Senate to protect their interests.

The Louisiana Purchase Exposition is the world's first really great show-up of governmental methods and resources. A comparison makes melancholy reading for many nations. This is one place where brag does not avail. My good friends in England, if they will go carefully over this Exposition, will begin to understand why England cut such a poor figure in the Boer war, and why her supremacy is threatened in so many directions. Her display in the Department of Education is almost the poorest made by any nation. There is evidence that the importance of teaching science to all classes is penetrating the Scottish mind, but is making very little impression on that of England and Ireland. If England's colonies promise to outstrip her in virility, it is because they are grasping more fully the educational problems of the day.

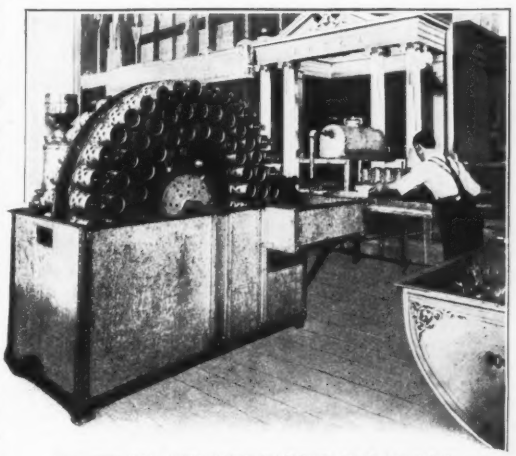
In prosperous little Belgium we have an exhibition of what intelligent organization under governmental direction may do for a people—and how prosperous they may become under such guidance.

Here is a bit of statistics which we found on the walls in the Belgian Building, which it will be well to ponder over:

COMPARATIVE TABLE OF THE INDUSTRIAL POWER OF THE PRINCIPAL COUNTRIES OF EUROPE.

PROPORTION OF THE NUMBER OF WORKMEN TO TOTAL POPULATION.

Great Britain,	16.15
Germany,	10.96
Belgium,	10.61
Austria,	8.20
France,	7.43
Sweden,	5.72
Hungary,	5.12
Russia,	1.64
Italy,	1.56



MACHINE FOR AUTOMATIC WASHING OF GLASSWARE.

PRACTICAL EXHIBIT OF THE POTTER'S WHEEL.

This tells the story of England's rise to greatness, of the prosperity of Germany and Belgium, and of Russia's troubles in 1904.

As the government required a Department of Commerce and Labor, so it should have one devoted to hygiene. The health of the American people should be viewed from the standpoint taken by Germany, namely: that it is the greatest factor in the success of a nation, whether considering the workman in the shop or the soldier in the field.

Upon sound minds in sound bodies depend the development of our resources, the production of wealth and the capacity to fight if it should be necessary to defend the liberties of the nation; and further, our people must be made to understand the handicaps which are placed upon commerce by giving to private interests the exercise of functions which should be governmental.

A WORD IN CONCLUSION.

THE original arrangement for this number of THE COSMOPOLITAN included thirty-two articles. As the work progressed, it was found impossible to bring all of these within the space of one hundred and twenty pages, and at the same time do justice to the illustrative portion of the work. It was first found necessary to increase the number to one hundred and forty-four pages, and even then to omit articles which had been prepared on a number of subjects, or to abbreviate them, as in the case of the article on "Transportation."

It would require a thousand pages to do anything like justice to the exhibits. Therefore, the only possible course was to avoid the guide-book and catalogue method, and to seize, if possible, upon the salient points, to touch upon those things which were new, out of the usual, or important, and to draw lessons from the exhibits. The necessity of having this number on the presses in time for issue on August 25th made it difficult to secure all the photographic work which had been ordered, and rendered necessary the distribution of illustrations through the number, often without reference to the articles which they illustrated.

The reader will also understand that the making within the space of eleven days of the studies required to cover this great Exposition, and the writing of so many pages, has surrounded the work with difficulties. It is a task which in the ordinary course of events would demand months instead of days.

In undertaking to write this number, it has been necessary to mention various individuals and corporations. This has been done without hesitation because the matters spoken of are important enough to be of public interest. It is unnecessary for THE COSMOPOLITAN to say that no word of mention in any part of this number is paid advertising. What has been written here is considered solely from the standpoint of the public. If it benefits any private individuals, that is their gain, and they are under no obligation whatever, because their advantage was in no wise considered. This magazine, which is possibly the most careful study of an exposition ever undertaken, and the most fully illustrated book on a world's fair, is prepared and issued solely in the interest of THE COSMOPOLITAN'S public.

HOW AMERICANS WILL HONOR OUR NATIONAL HERO.
The place for Frederick the Great is now at last settled to the satisfaction of the Americans.
From Simplicissimus, of Munich.

WEEPS. GERMANY SMILES.
The chancellor observes the ideal of strictest neutrality.
From Kladderadatsch, of Berlin.

HYPNOTIC "SUGGESTION."
A remarkable performance is being given in London in which a lady is hypnotized. Whilst in a trance she dances to whatever music is played to her.
From Punch, of London.

WHAT CAN THE POOR ELEPHANT DO?
From the Philadelphia Record.

"IS THIS WHAT YOU CALL CIVILIZATION, BOSS?"
From the New York World.

ÆGIR THE OCEAN-GOD AS IN THE YELLOW SEA.
From Lustige Blätter, of Berlin.

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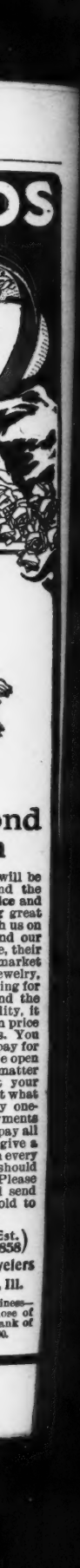
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